

Anatomy: CNS and CN lesions

Question 1 of 142



Which of the following nerves is the efferent pathway of the corneal blink reflex:

- ☐ a Ophthalmic nerve
- ☐ b Oculomotor nerve
- ☐ c Optic nerve
- ☐ d Facial nerve
- ☐ e Maxillary nerve

[Next >](#)

[See Answer](#)

[Something wrong?](#)

Question Navigator

1 Current Question

2 ...

3 ...

4 ...

5 ...

6 ...

7 ...

8 ...

9 ...

10 ...

11 ...

12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 1 of 142



Which of the following nerves is the efferent pathway of the corneal blink reflex:

- a) Ophthalmic nerve
- b) Oculomotor nerve
- c) Optic nerve
- d) Facial nerve
- e) Maxillary nerve

Answer

The facial nerve is the efferent pathway of the corneal blink reflex. The ophthalmic division of the trigeminal nerve is the afferent pathway of the corneal blink reflex.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

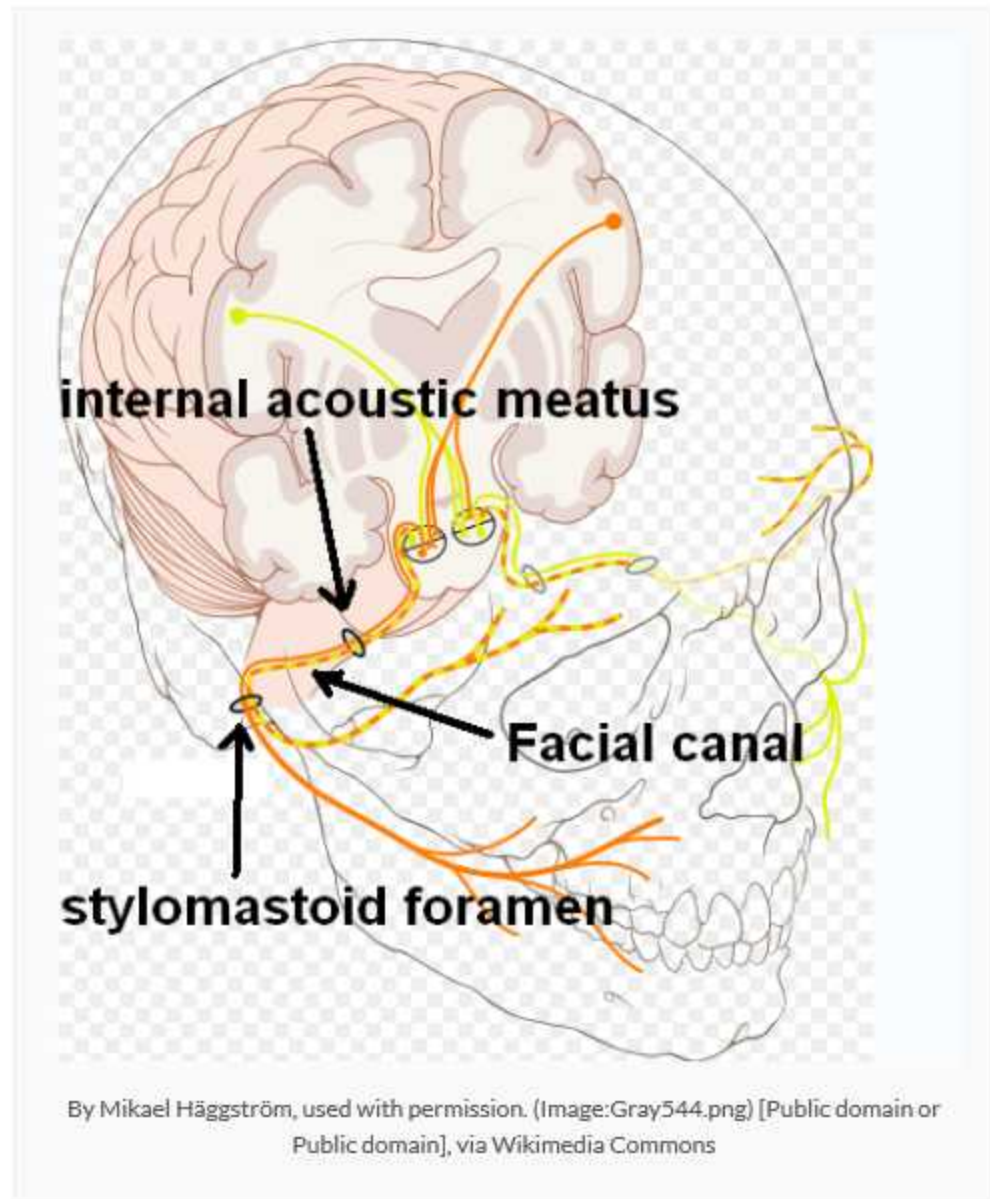
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (Innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (Innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

Next >

Something wrong?

Question Navigator

1	Current Question
2	...
3	...
4	...
5	...
6	...
7	...
8	...
9	...
10	...
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 2 of 142



What type of visual field defect are you most likely to see in a lesion at the optic chiasm:

- ☐ a Bitemporal hemianopia
- ☐ b Contralateral homonymous inferior quadrantanopia
- ☐ c Contralateral homonymous hemianopia
- ☐ d Contralateral homonymous superior quadrantanopia
- ☐ e Homonymous hemianopia with macular sparing

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Current Question
- 3 ...
- 4 ...
- 5 ...
- 6 ...
- 7 ...
- 8 ...
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 2 of 142



What type of visual field defect are you most likely to see in a lesion at the optic chiasm:

- a) **Bitemporal hemianopia** ✓
- b) Contralateral homonymous inferior quadrantanopia
- c) Contralateral homonymous hemianopia
- d) Contralateral homonymous superior quadrantanopia
- e) Homonymous hemianopia with macular sparing

Answer

A lesion at the optic chiasm will result in a bitemporal hemianopia.

Notes

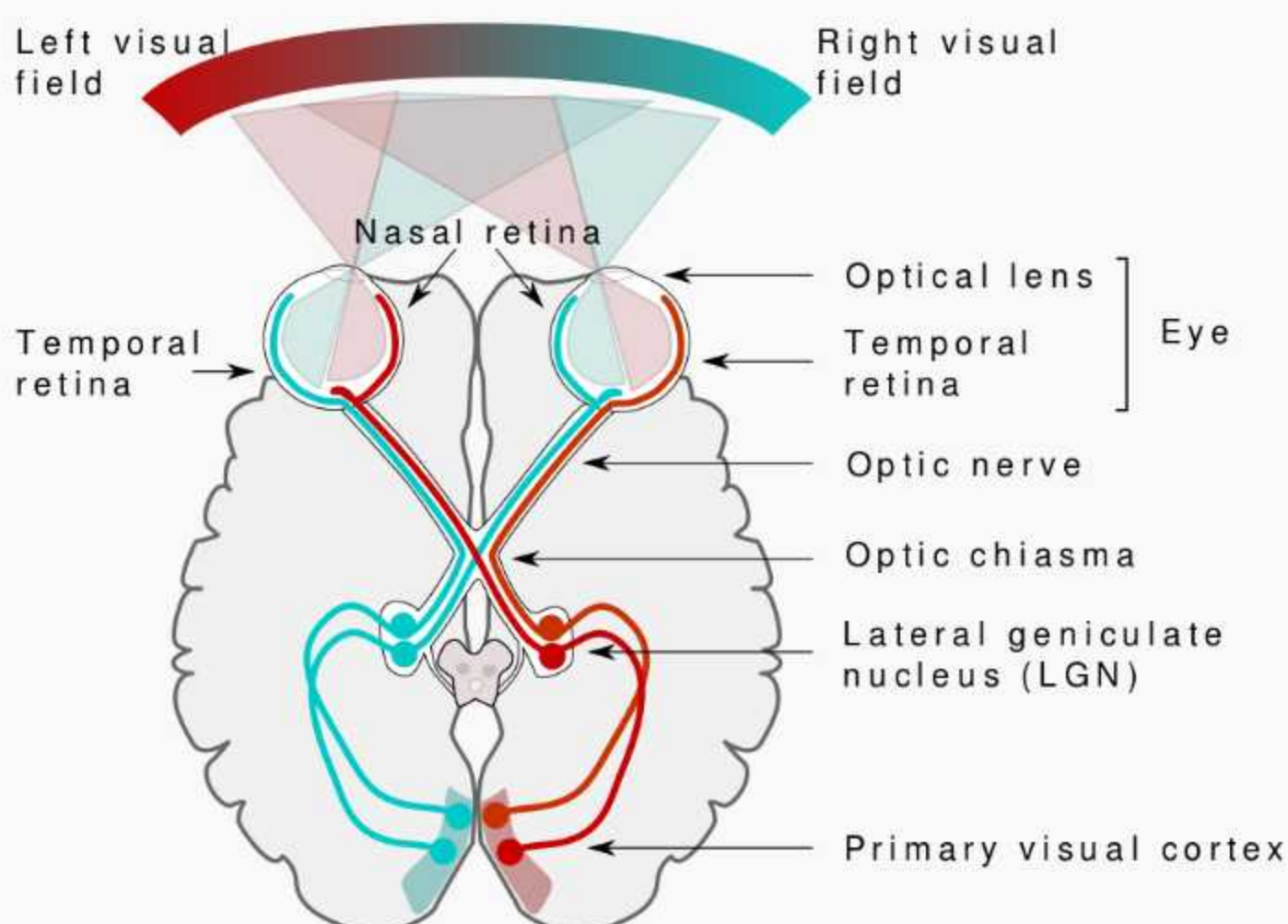
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (<http://creativecommons.org/licenses/by-sa/4.0/>)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

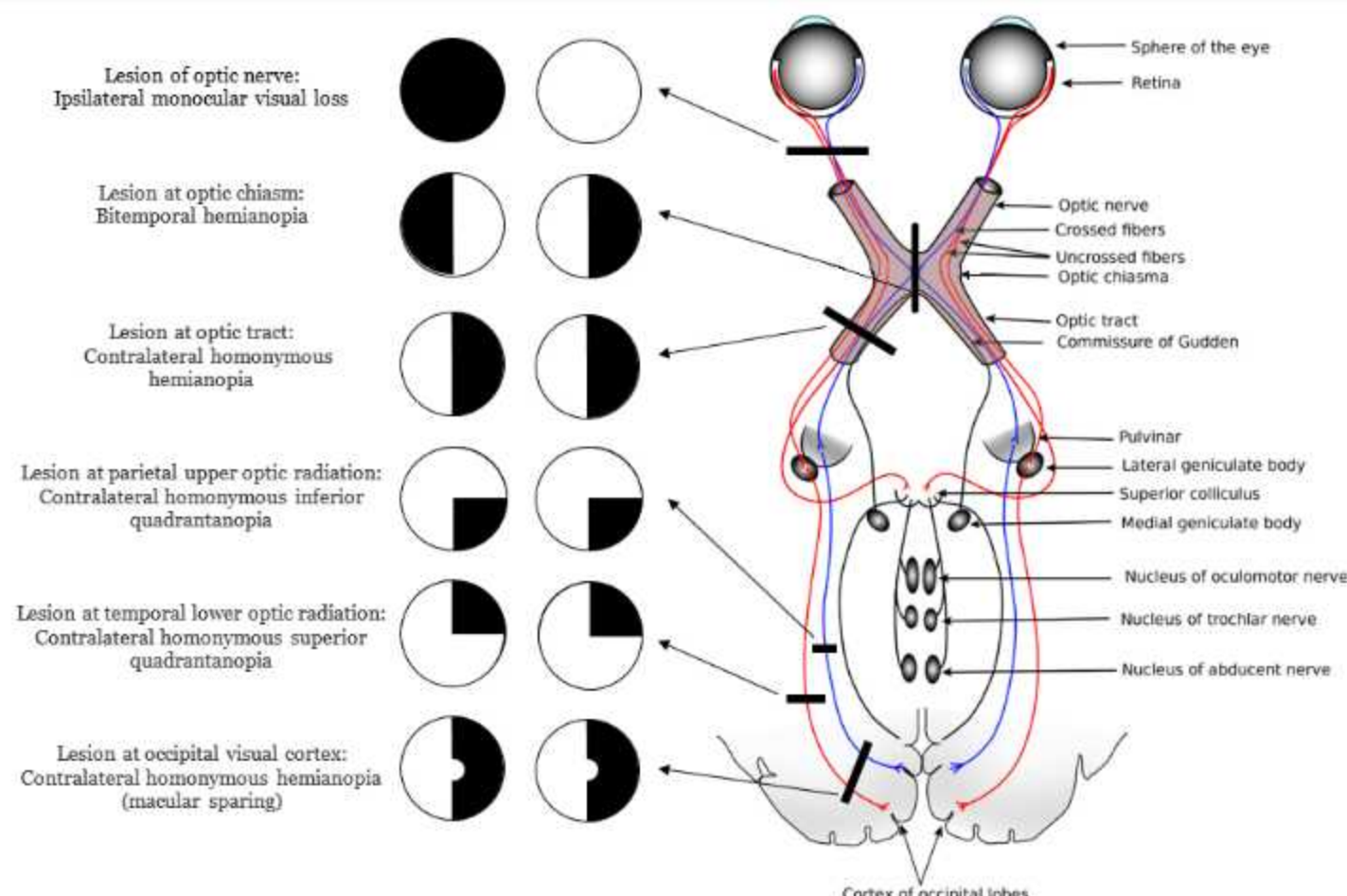
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get In Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 3 of 142



Which of the following best describes the position of the frontal lobe:

- ☐ a Anterior to the parieto-occipital sulcus
- ☐ b Anterior to the central sulcus and superior to the lateral sulcus
- ☐ c Posterior to the central sulcus and superior to the lateral sulcus
- ☐ d Anterior to the central sulcus and inferior to the lateral sulcus
- ☐ e Posterior to the central sulcus and inferior to the lateral sulcus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Current Question
- 4 ...
- 5 ...
- 6 ...
- 7 ...
- 8 ...
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 3 of 142



Which of the following best describes the position of the frontal lobe:

- a) Anterior to the parieto-occipital sulcus
- b) Anterior to the central sulcus and superior to the lateral sulcus
- c) Posterior to the central sulcus and superior to the lateral sulcus
- d) Anterior to the central sulcus and inferior to the lateral sulcus
- e) Posterior to the central sulcus and inferior to the lateral sulcus

Answer

The frontal lobe extends from the central sulcus to the frontal pole and lies anterior to the central sulcus and superior to the lateral sulcus.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebral cortex

The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe - anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe - posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe - inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe - posteroinferior to the parieto-occipital sulcus



By BruceBlaus (Own work) [CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (http://creativecommons.org/licenses/by/4.0)], via Wikimedia Commons

Question Navigator

1	Answered
2	Answered
3	Current Question
4	...
5	...
6	...
7	...
8	...
9	...
10	...
11	...
12	...

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 4 of 142



The glossopharyngeal nerve exits the skull through the:

- ☐ a Foramen rotundum
- ☐ b Foramen ovale
- ☐ c Hypoglossal canal
- ☐ d Internal acoustic meatus
- ☐ e Jugular foramen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Current Question
- 5 ...
- 6 ...
- 7 ...
- 8 ...
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 4 of 142



The glossopharyngeal nerve exits the skull through the:

- a) Foramen rotundum
- b) Foramen ovale
- c) Hypoglossal canal
- d) Internal acoustic meatus
- e) Jugular foramen

Answer

The glossopharyngeal nerve exits the skull through the jugular foramen.

Notes

The glossopharyngeal nerve (CN IX) mediates taste, salivation and swallowing (together with CN X).

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Key anatomy

The glossopharyngeal nerve originates from the medulla and travels lateral in the posterior cranial fossa before emerging from the cranial cavity via the jugular foramen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

Function

The glossopharyngeal nerve carries:

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

Clinical implications

CN IX palsy will result in:

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

Isolated glossopharyngeal nerve palsy is rare. It is usually damaged with CN X and XI, close to the jugular foramen.

Causes of damage to CN IX include:

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Question Navigator

1	Answered
2	Answered
3	Answered
4	Current Question
5	...
6	...
7	...
8	...
9	...
10	...
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 5 of 142



Which of the following is NOT a typical feature of trochlear nerve palsy:

- ☐ a Patient head tilts to side of affected eye
- ☐ b Patient has weakness of downward gaze
- ☐ c Patient has vertical diplopia
- ☐ d Patient has difficulty walking downstairs
- ☐ e Eye is extorted and elevated

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Current Question
- 6 ...
- 7 ...
- 8 ...
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 5 of 142



Which of the following is NOT a typical feature of trochlear nerve palsy:

- a) Patient head tilts to side of affected eye ✓
- b) Patient has weakness of downward gaze
- c) Patient has vertical diplopia
- d) Patient has difficulty walking downstairs
- e) Eye is extorted and elevated ✗

Answer

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

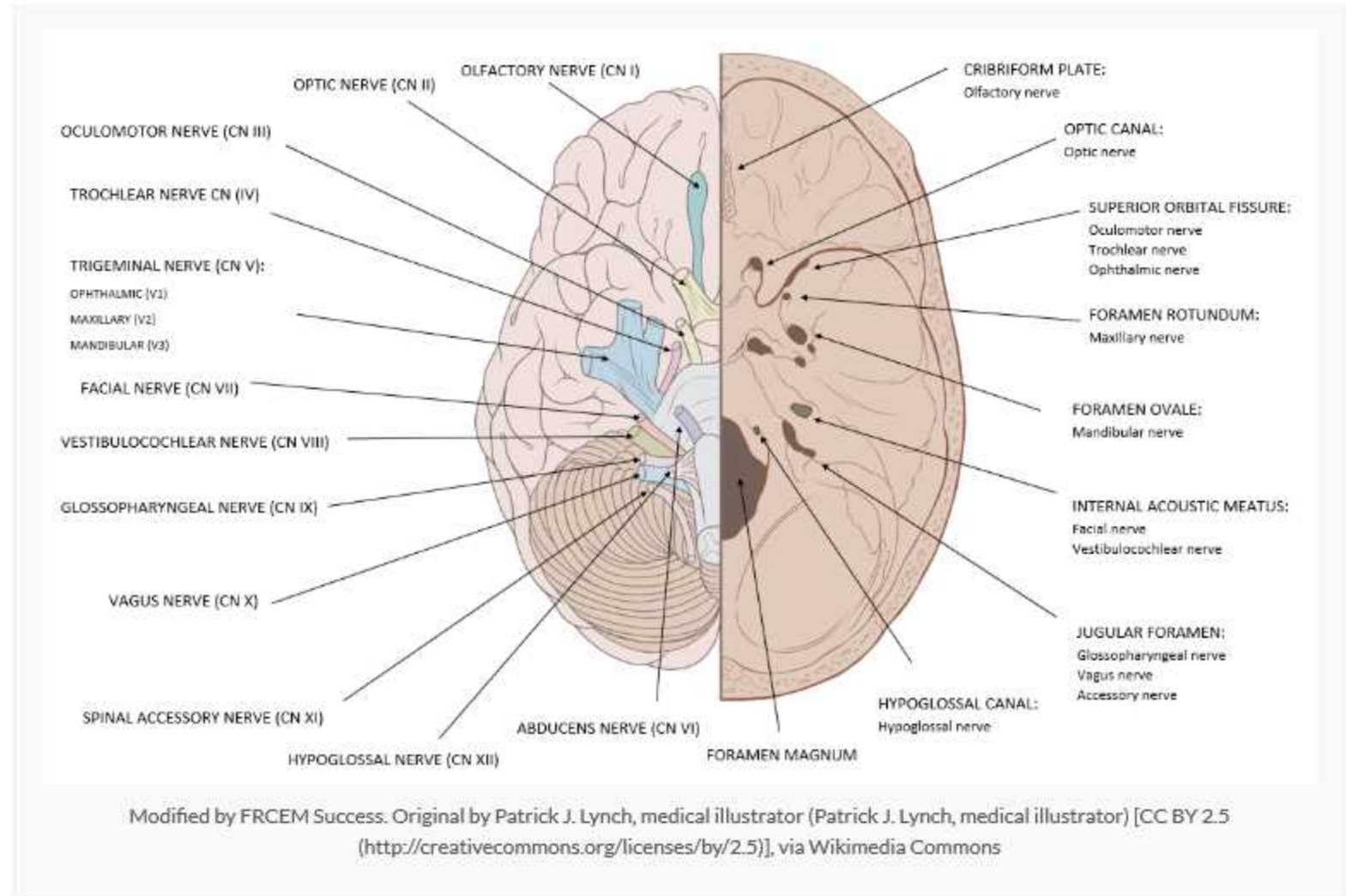
Notes

The trochlear nerve (CN IV) is a motor nerve supplying the superior oblique muscle of the eye.

Cranial nerve	Trochlear nerve (CN IV)
Key anatomy	Arises from midbrain, travels through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: superior oblique muscle of eye (intorsion, depression and abduction of eye)
Assessment	Eye movements
Clinical effects of injury	Weakness of downward gaze (difficulty reading/walking downstairs), vertical diplopia, eye is extorted and may be elevated (patient head tilts to opposite side to compensate)
Causes of injury	Idiopathic, trauma, microvasculopathy, cavernous sinus disease, raised intracranial pressure

Anatomical course

It is the smallest cranial nerve but has the longest cranial course. It arises from the trochlear nucleus and decussates within the midbrain, emerging from the posterior aspect of the midbrain. It runs anteroinferiorly within the subarachnoid space before piercing the dura and travelling along the lateral wall of the cavernous sinus, before entering the orbit of the eye via the superior orbital fissure.



Function

The superior oblique primarily rotates the top of the eye towards the nose (intorsion). Secondly, it moves the eye downward (depression) and outward (abduction). It prevents the unopposed action of the superior rectus which would otherwise rotate the globe.

Clinical implications

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

Causes of damage include:

- Idiopathic (most commonly)
- Trauma
- Microvasculopathy (associated with diabetes and hypertension)
- Multiple sclerosis
- Lesions in the midbrain
- Cavernous sinus disease
- Raised intracranial pressure

Question Navigator

1	Answered
2	Answered
3	Answered
4	Answered
5	Current Question
6	...
7	...
8	...
9	...
10	...
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 6 of 142



The facial nerve divides into its five terminal branches at which of the following sites:

- ☐ a Within the parotid gland
- ☐ b At the lateral corner of the eye
- ☐ c Posterior to the parotid gland
- ☐ d At the lower border of the mandible
- ☐ e Posterior to the submandibular gland

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Current Question
- 7 ...
- 8 ...
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 6 of 142

The facial nerve divides into its five terminal branches at which of the following sites:

- a) Within the parotid gland
- b) At the lateral corner of the eye
- c) Posterior to the parotid gland
- d) At the lower border of the mandible
- e) Posterior to the submandibular gland

Answer

The facial nerve divides into its five terminal branches within the parotid gland.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

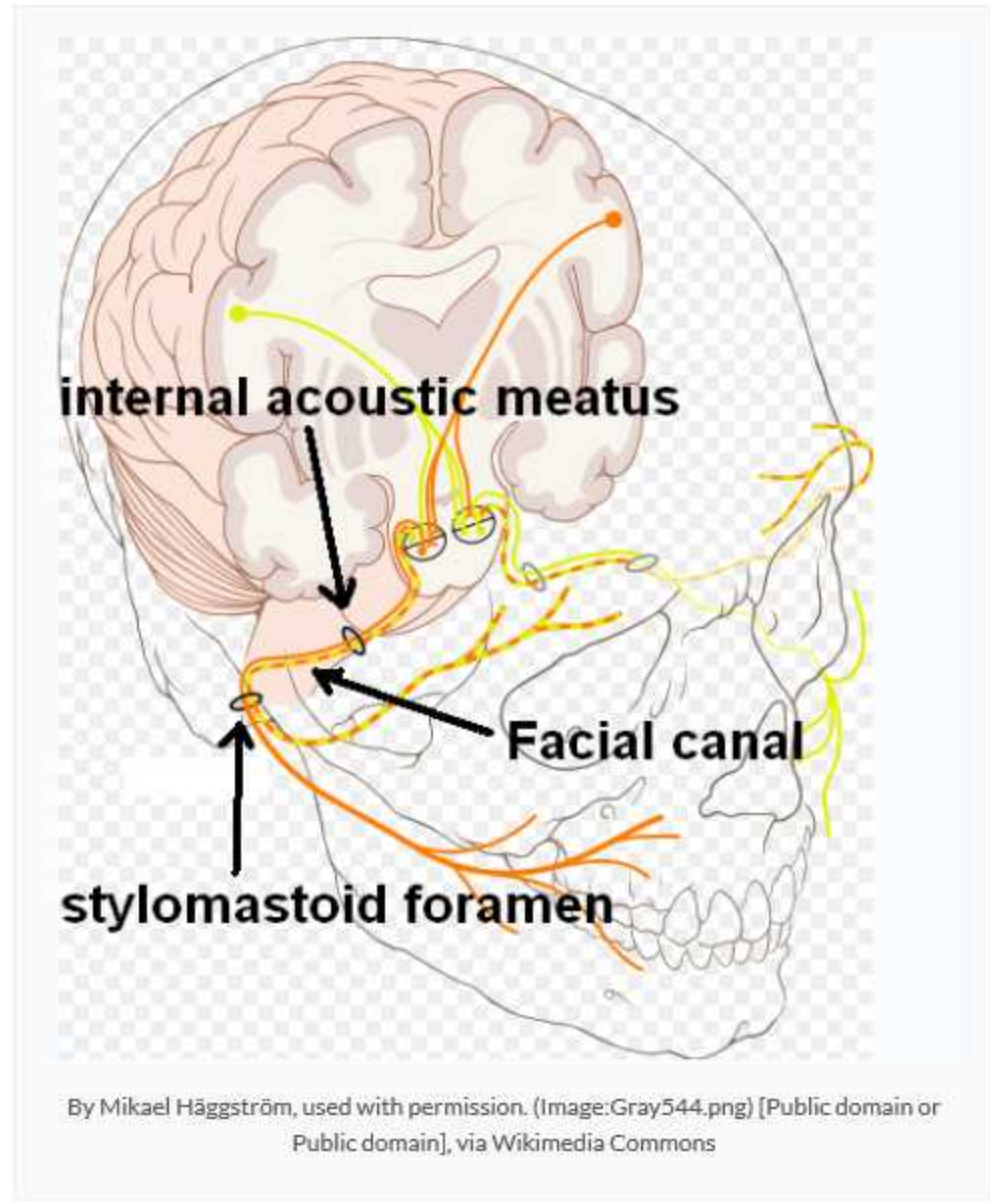
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

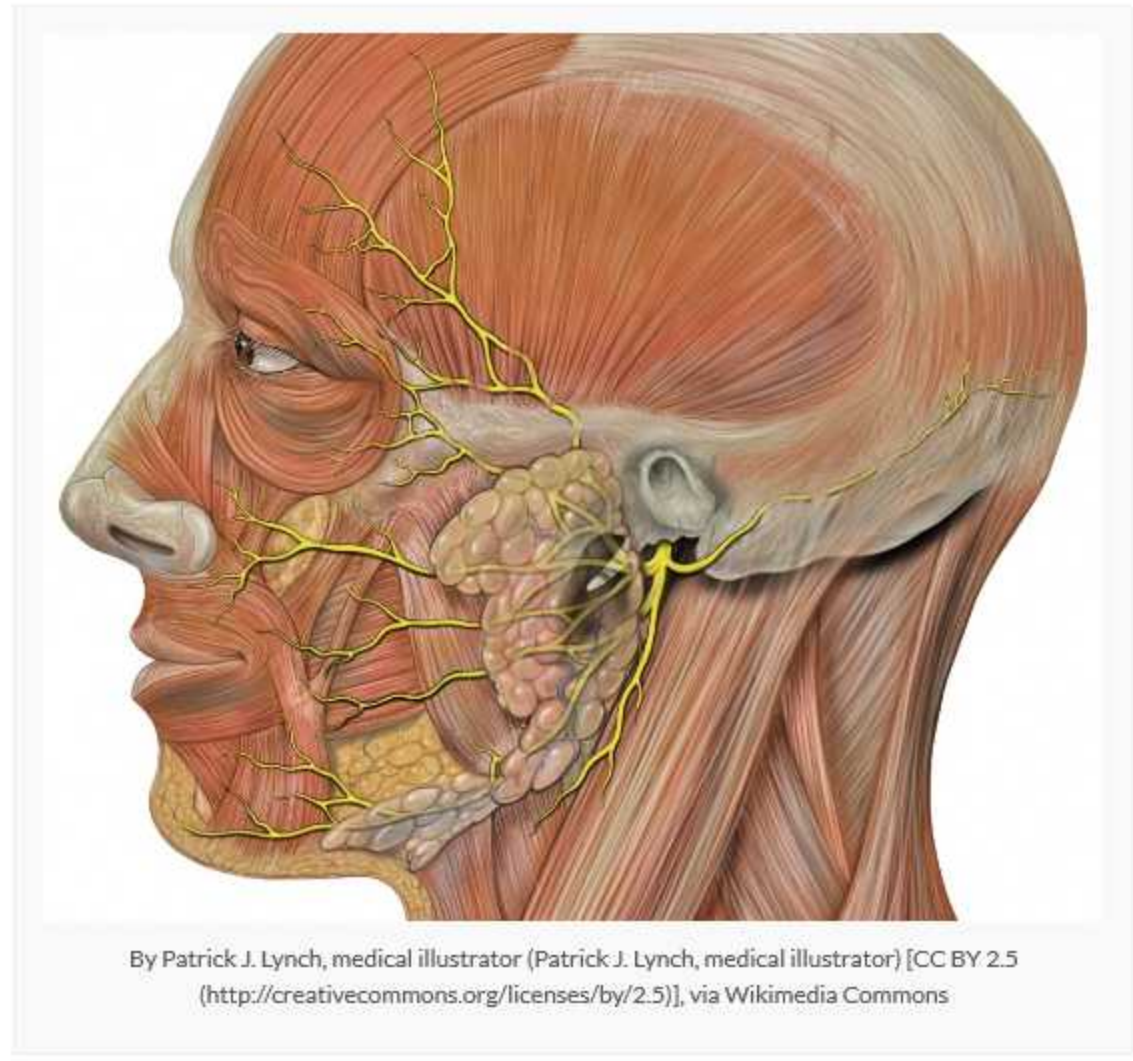
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

< Previous

Next >

Something wrong?

Question Navigator

1	Answered
2	Answered
3	Answered
4	Answered
5	Answered
6	Current Question
7	...
8	...
9	...
10	...
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 7 of 142



Which of the following nerves is the efferent pathway of the gag reflex:

- ☐ a Facial nerve
- ☐ b Glossopharyngeal nerve
- ☐ c Hypoglossal nerve
- ☐ d Vagus nerve
- ☐ e Mandibular nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Current Question
- 8 ...
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 7 of 142



Which of the following nerves is the efferent pathway of the gag reflex:

- a) Facial nerve
- b) Glossopharyngeal nerve
- c) Hypoglossal nerve
- d) Vagus nerve
- e) Mandibular nerve

Answer

The vagus nerve is the efferent pathway of the gag reflex. The glossopharyngeal nerve is the afferent pathway of the gag reflex.

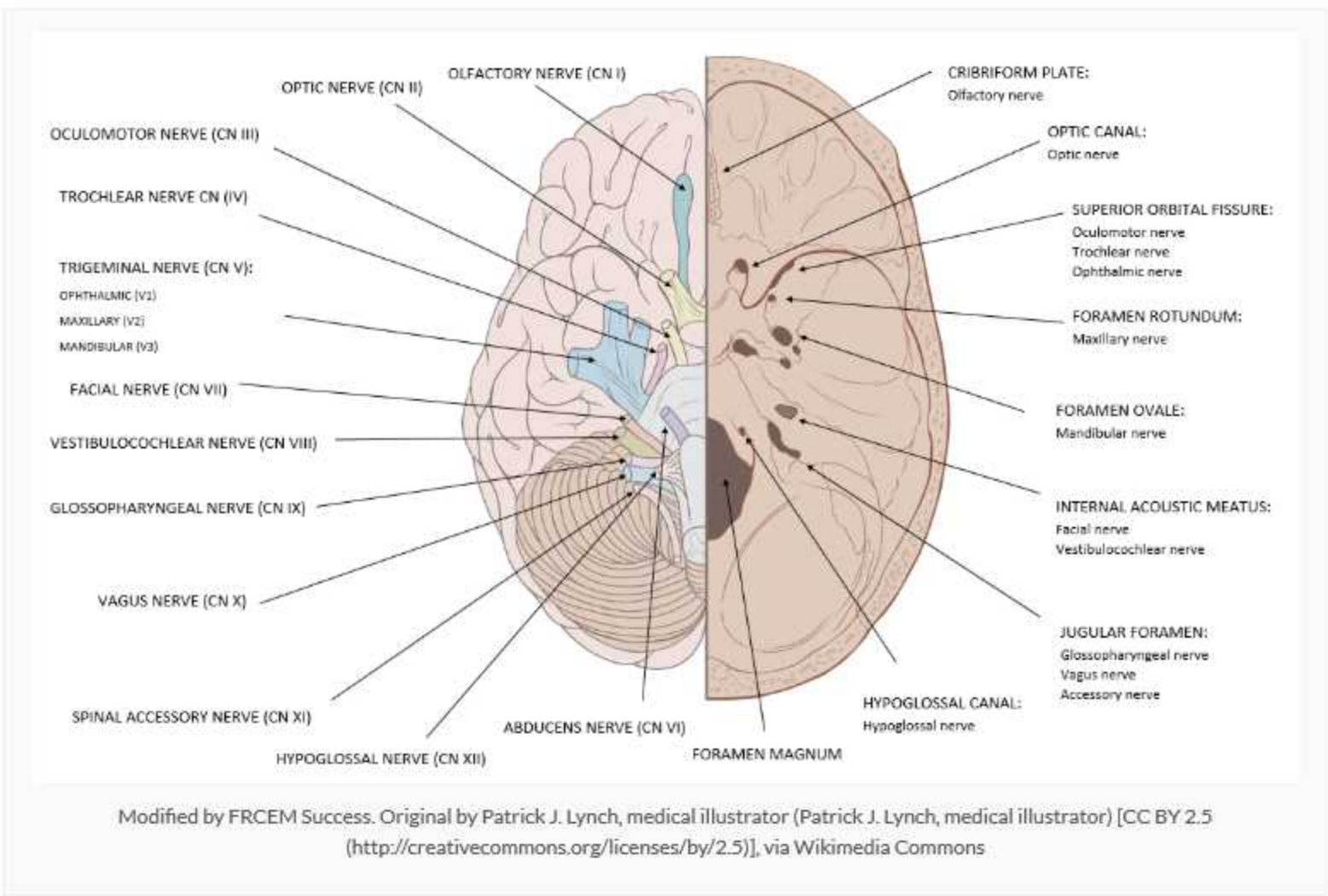
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say 'ahhh' to look for uvula deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvula deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvula will move asymmetrically when the patient says 'ahh' – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

Question Navigator

1	Answered
2	Answered
3	Answered
4	Answered
5	Answered
6	Answered
7	Current Question
8	...
9	...
10	...
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 8 of 142



A patient presents with an adducted eye at rest which cannot abduct past the midline, which of the following cranial nerves is most likely to be affected:

- ☐ a Trochlear nerve
- ☐ b Abducens nerve
- ☐ c Oculomotor nerve
- ☐ d Optic nerve
- ☐ e Ophthalmic division of the trigeminal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Current Question
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 8 of 142



A patient presents with an adducted eye at rest which cannot abduct past the midline, which of the following cranial nerves is most likely to be affected:

- a) Trochlear nerve
- b) Abducens nerve
- c) Oculomotor nerve
- d) Optic nerve
- e) Ophthalmic division of the trigeminal nerve

Answer

CN VI palsies result in a convergent squint at rest (eye turned inwards) with inability to abduct the eye because of unopposed action of the rectus medialis. The patient complains of horizontal diplopia when looking towards the affected side. With complete paralysis, the eye cannot abduct past the midline.

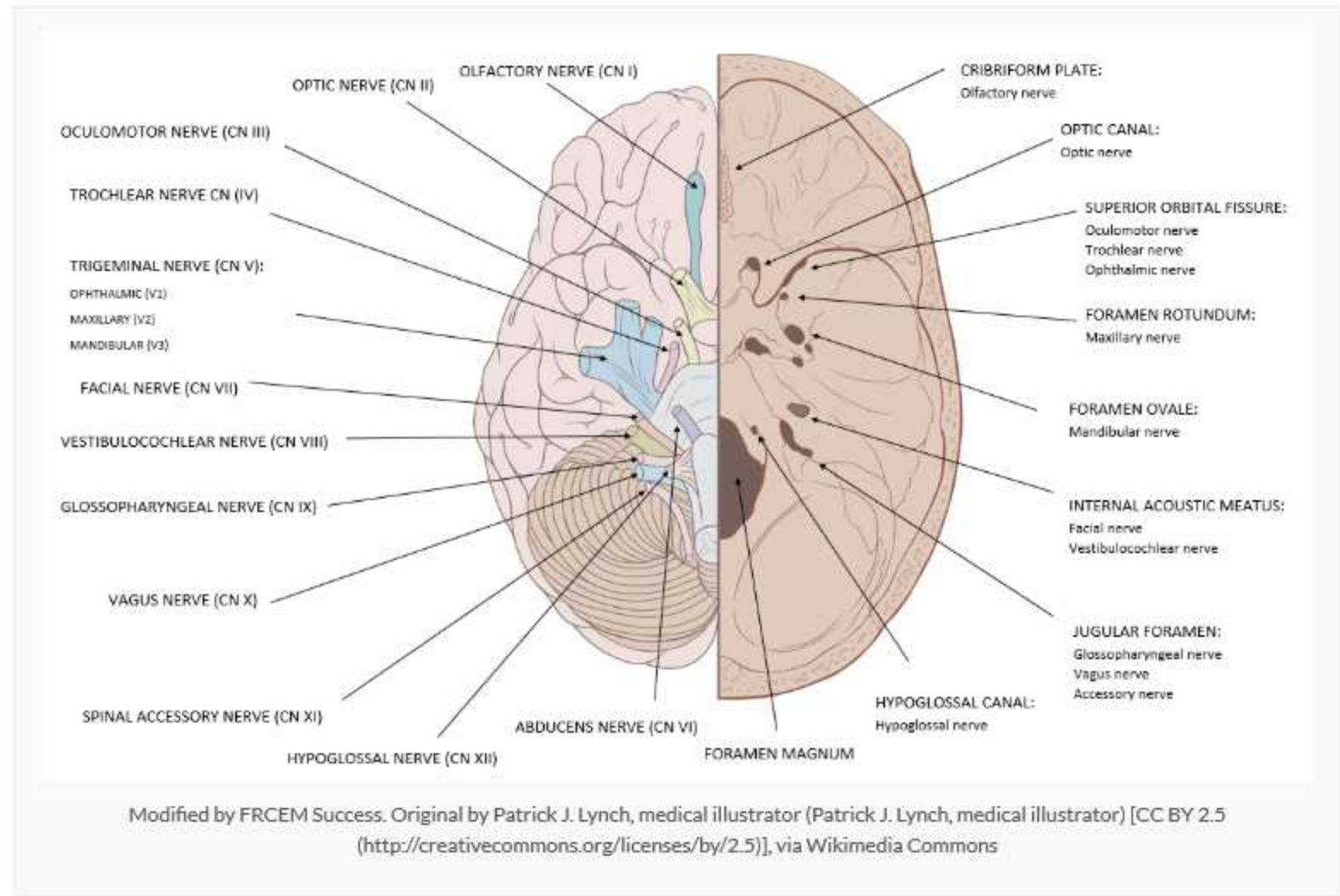
Notes

The abducens nerve (CN VI) is a motor nerve supplying the lateral rectus muscle which acts to abduct the eye.

Cranial nerve	Abducens nerve (CN VI)
Key anatomy	Arises from pons, travels through cavernous sinus, exits skull through superior orbital fissure
Function	Motor: lateral rectus muscle of eye (abducts eye)
Assessment	Eye movements
Clinical effects of injury	Convergent squint with inability to abduct eye, horizontal diplopia
Causes of injury	Idiopathic, brain tumours, extradural haematoma, cavernous sinus disease, diabetes mellitus, Wernicke-Korsakoff syndrome

Anatomical course

The nerve originates in the pons and exits the brainstem from the inferior pontine sulcus to travel in the subarachnoid space. It traverses the cavernous sinus where it runs alongside the internal carotid artery, and enters the orbit through the superior orbital fissure.



Clinical implications

CN VI palsies result in a convergent squint at rest (eye turned inwards) with inability to abduct the eye because of unopposed action of the rectus medialis. The patient complains of horizontal diplopia when looking towards the affected side. With complete paralysis, the eye cannot abduct past the midline.

Causes of CN VI palsy include:

- Idiopathic
- Diabetes, hypertension
- Pontine stroke
- Extradural haematoma
- Demyelination
- Wernicke's encephalopathy
- Giant cell arteritis
- Tumours (e.g. cerebellopontine angle tumours)
- Basilar artery aneurysm
- Cavernous sinus disease
- Infections e.g. subacute meningitis, tuberculosis
- Trauma (up to one-third of cases)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Current Question
- 9 ...
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 9 of 142



Which of the following is NOT a typical feature of an abducens nerve palsy:

- ☐ a Convergent squint at rest
- ☐ b Horizontal diplopia
- ☐ c Loss of abduction
- ☐ d Adducted eye at rest
- ☐ e Inability to look up

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Answered
- 9 Current Question
- 10 ...
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 9 of 142

Which of the following is NOT a typical feature of an abducens nerve palsy:

- a) Convergent squint at rest
- b) Horizontal diplopia
- c) Loss of abduction
- d) Adducted eye at rest
- e) Inability to look up

Answer

CN VI palsies result in a convergent squint at rest (eye turned inwards) with inability to abduct the eye because of unopposed action of the rectus medialis. The patient complains of horizontal diplopia when looking towards the affected side. With complete paralysis, the eye cannot abduct past the midline.

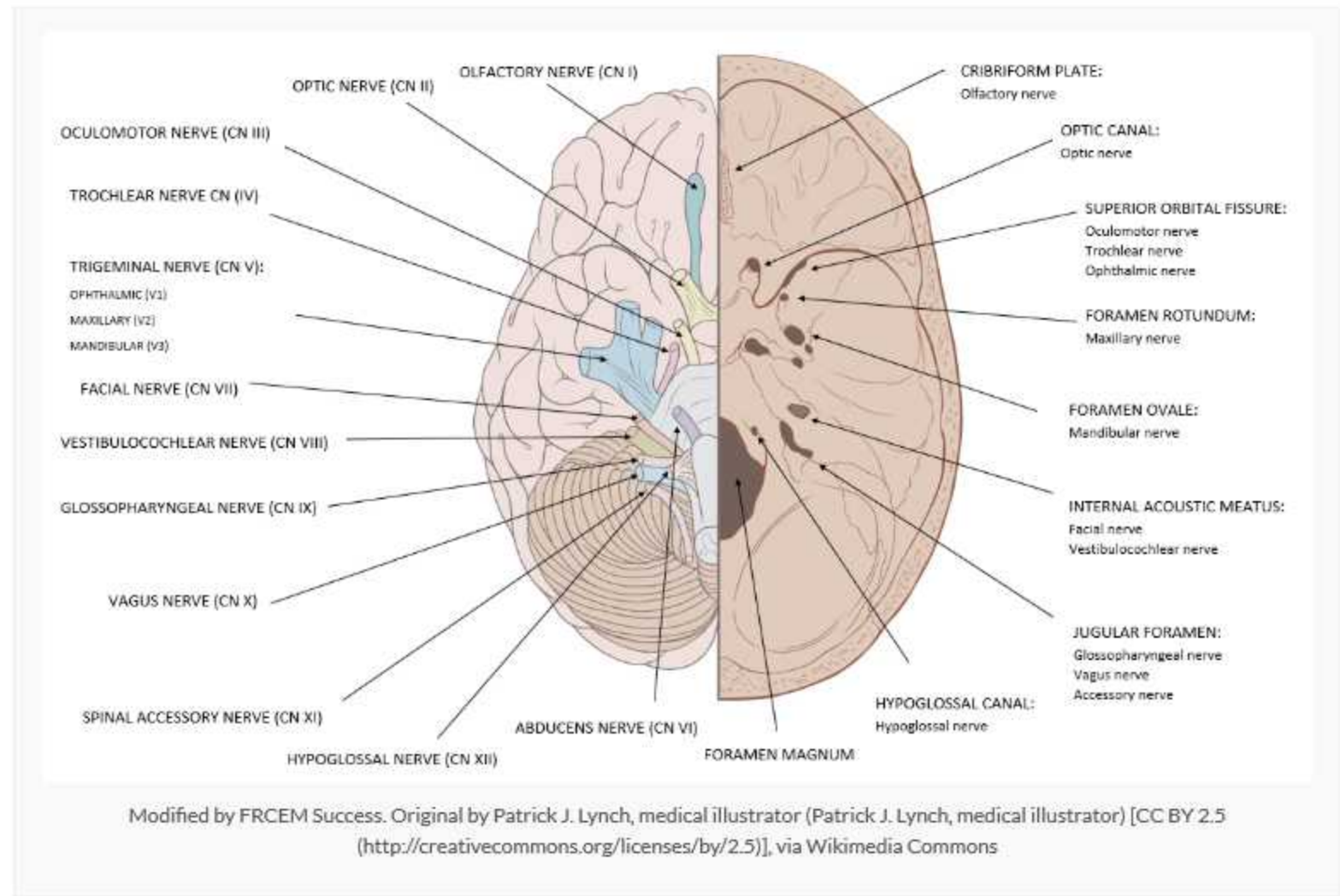
Notes

The abducens nerve (CN VI) is a motor nerve supplying the lateral rectus muscle which acts to abduct the eye.

Cranial nerve	Abducens nerve (CN VI)
Key anatomy	Arises from pons, travels through cavernous sinus, exits skull through superior orbital fissure
Function	Motor: lateral rectus muscle of eye (abducts eye)
Assessment	Eye movements
Clinical effects of injury	Convergent squint with inability to abduct eye, horizontal diplopia
Causes of injury	Idiopathic, brain tumours, extradural haematoma, cavernous sinus disease, diabetes mellitus, Wernicke-Korsakoff syndrome

Anatomical course

The nerve originates in the pons and exits the brainstem from the inferior pontine sulcus to travel in the subarachnoid space. It traverses the cavernous sinus where it runs alongside the internal carotid artery, and enters the orbit through the superior orbital fissure.



Clinical implications

CN VI palsies result in a convergent squint at rest (eye turned inwards) with inability to abduct the eye because of unopposed action of the rectus medialis. The patient complains of horizontal diplopia when looking towards the affected side. With complete paralysis, the eye cannot abduct past the midline.

Causes of CN VI palsy include:

- Idiopathic
- Diabetes, hypertension
- Pontine stroke
- Extradural haematoma
- Demyelination
- Wernicke's encephalopathy
- Giant cell arteritis
- Tumours (e.g. cerebellopontine angle tumours)
- Basilar artery aneurysm
- Cavernous sinus disease
- Infections e.g. subacute meningitis, tuberculosis
- Trauma (up to one-third of cases)

Question Navigator

1	Answered
2	Answered
3	Answered
4	Answered
5	Answered
6	Answered
7	Answered
8	Answered
9	Current Question
10	...
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 10 of 142



Regarding the vagus nerve, which of the following statements is CORRECT:

- ☐ a It exits the skull through the foramen ovale.
- ☐ b It carries general sensation from the oropharynx.
- ☐ c It carries visceral afferent fibres from the aortic arch baroreceptors.
- ☐ d It carries parasympathetic fibres to the parotid gland.
- ☐ e It is the afferent nerve of the gag reflex.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Answered
- 9 Answered
- 10 Current Question
- 11 ...
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 10 of 142



Regarding the vagus nerve, which of the following statements is CORRECT:

- a) It exits the skull through the foramen ovale.
- b) It carries general sensation from the oropharynx.
- c) It carries visceral afferent fibres from the aortic arch baroreceptors. ✓
- d) It carries parasympathetic fibres to the parotid gland. ✗
- e) It is the afferent nerve of the gag reflex.

Answer

The vagus nerve carries visceral afferent fibres from the .aortic arch baroreceptors. The glossopharyngeal nerve supplies parasympathetic fibres to the parotid gland, and general sensation to the oropharynx. The vagus nerve is the efferent pathway of the gag reflex, the glossopharyngeal nerve being the afferent pathway. The vagus nerve exits the skull through the jugular foramen.

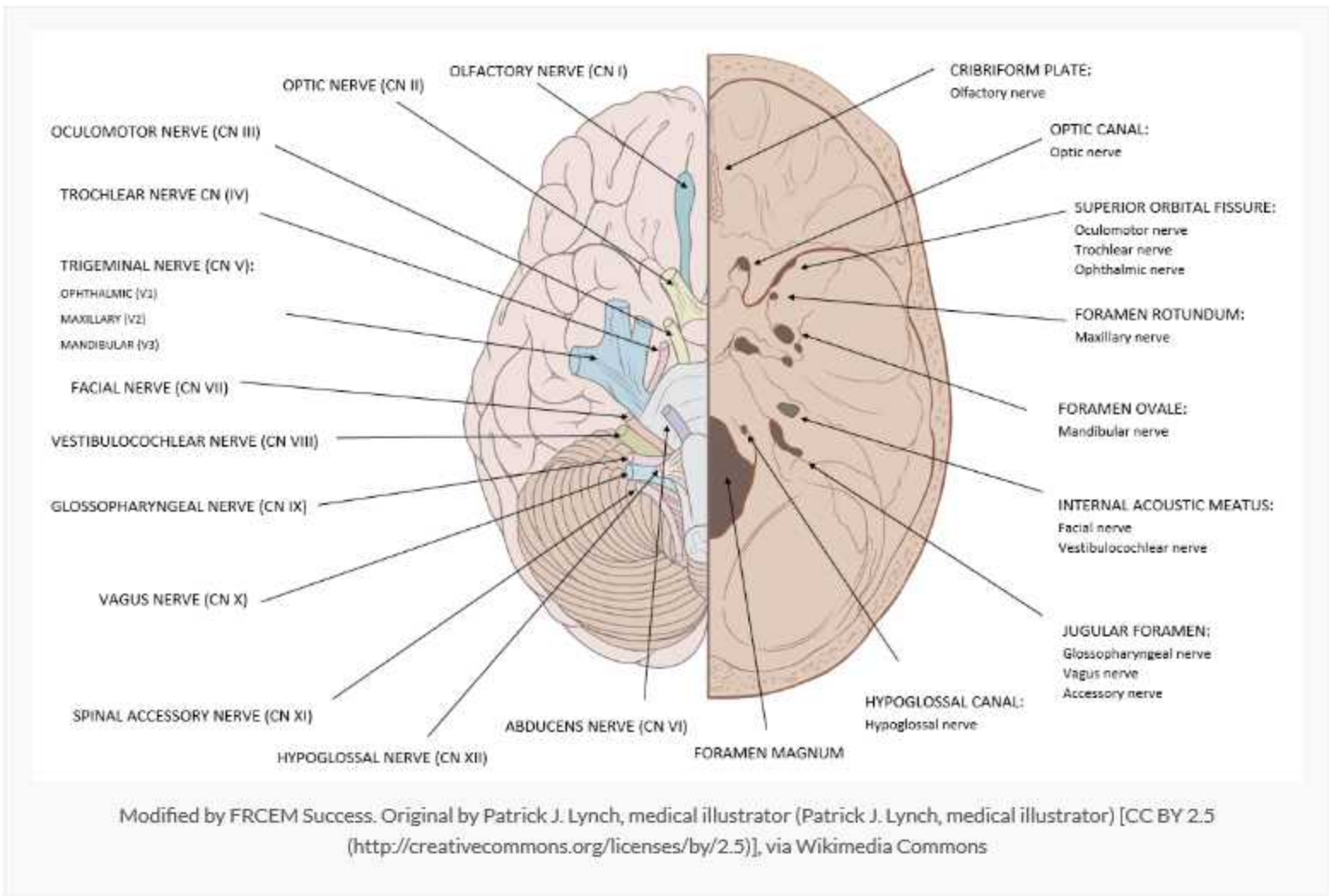
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say 'ahhh' to look for uvula deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvula deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvula will move asymmetrically when the patient says 'ahh' – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

Question Navigator

1	Answered
2	Answered
3	Answered
4	Answered
5	Answered
6	Answered
7	Answered
8	Answered
9	Answered
10	Current Question
11	...
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 11 of 142



The abducens nerve innervates which of the following muscles:

- ☐ a Inferior oblique
- ☐ b Superior oblique
- ☐ c Medial rectus
- ☐ d Lateral rectus
- ☐ e Superior rectus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Answered
- 9 Answered
- 10 Answered
- 11 Current Question
- 12 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 11 of 142



The abducens nerve innervates which of the following muscles:

- a) Inferior oblique
- b) Superior oblique
- c) Medial rectus
- d) Lateral rectus
- e) Superior rectus

Answer

The abducens nerve innervates the lateral rectus muscle.

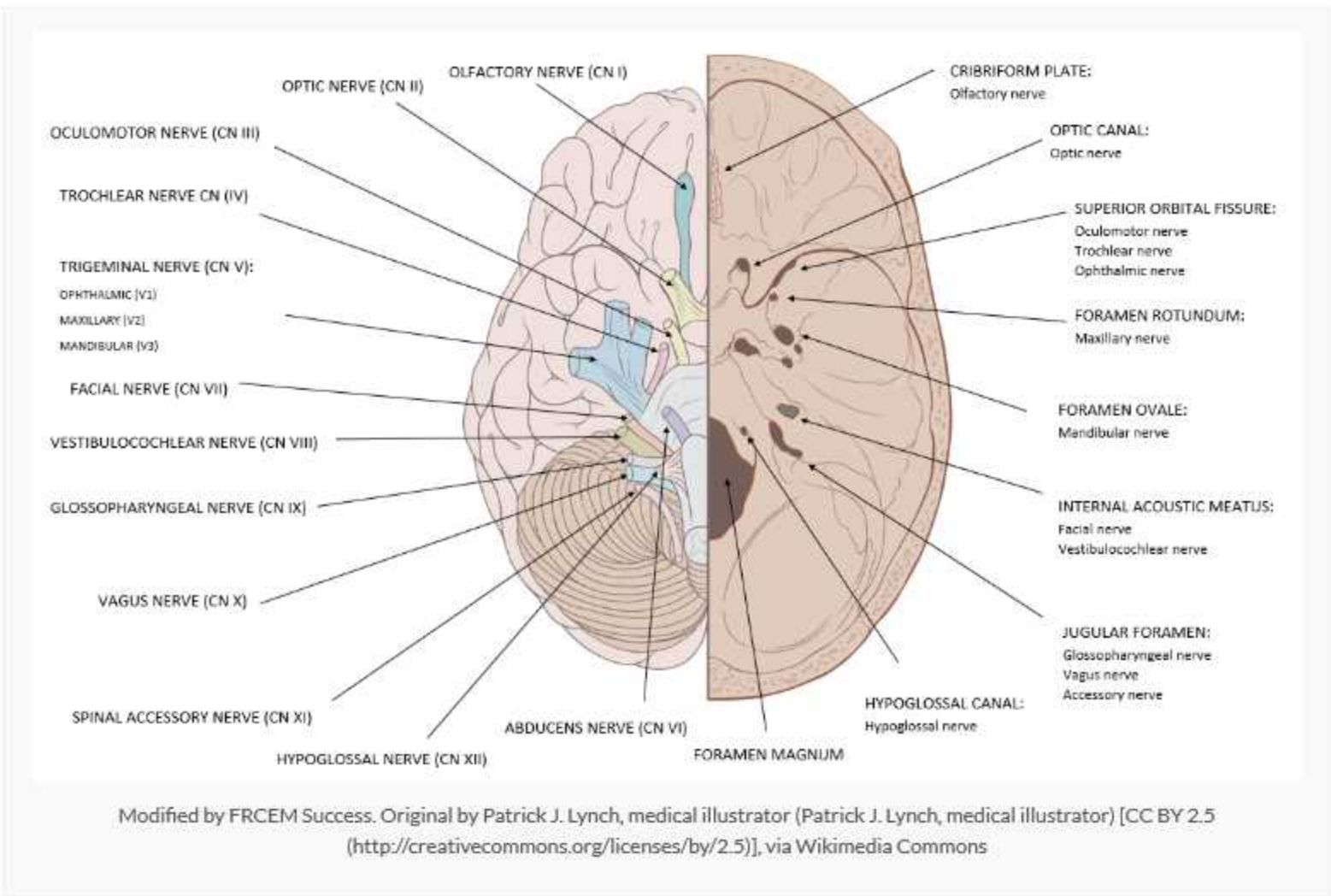
Notes

The abducens nerve (CN VI) is a motor nerve supplying the lateral rectus muscle which acts to abduct the eye.

Cranial nerve	Abducens nerve (CN VI)
Key anatomy	Arises from pons, travels through cavernous sinus, exits skull through superior orbital fissure
Function	Motor: lateral rectus muscle of eye (abducts eye)
Assessment	Eye movements
Clinical effects of injury	Convergent squint with inability to abduct eye, horizontal diplopia
Causes of injury	Idiopathic, brain tumours, extradural haematoma, cavernous sinus disease, diabetes mellitus, Wernicke-Korsakoff syndrome

Anatomical course

The nerve originates in the pons and exits the brainstem from the inferior pontine sulcus to travel in the subarachnoid space. It traverses the cavernous sinus where it runs alongside the internal carotid artery, and enters the orbit through the superior orbital fissure.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

CN VI palsies result in a convergent squint at rest (eye turned inwards) with inability to abduct the eye because of unopposed action of the rectus medialis. The patient complains of horizontal diplopia when looking towards the affected side. With complete paralysis, the eye cannot abduct past the midline.

Causes of CN VI palsy include:

- Idiopathic
- Diabetes, hypertension
- Pontine stroke
- Extradural haematoma
- Demyelination
- Wernicke’s encephalopathy
- Giant cell arteritis
- Tumours (e.g. cerebellopontine angle tumours)
- Basilar artery aneurysm
- Cavernous sinus disease
- Infections e.g. subacute meningitis, tuberculosis
- Trauma (up to one-third of cases)

Question Navigator

1	Answered
2	Answered
3	Answered
4	Answered
5	Answered
6	Answered
7	Answered
8	Answered
9	Answered
10	Answered
11	Current Question
12	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 12 of 142



The vagus nerve exits the skull through the:

- ☐ a Foramen rotundum
- ☐ b Foramen ovale
- ☐ c Hypoglossal canal
- ☐ d Internal acoustic meatus
- ☐ e Jugular foramen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Answered
- 9 Answered
- 10 Answered
- 11 Answered
- 12 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 12 of 142

The vagus nerve exits the skull through the:

- a) Foramen rotundum
- b) Foramen ovale
- c) Hypoglossal canal
- d) Internal acoustic meatus
- e) Jugular foramen

Answer

The vagus nerve exits the skull through the jugular foramen.

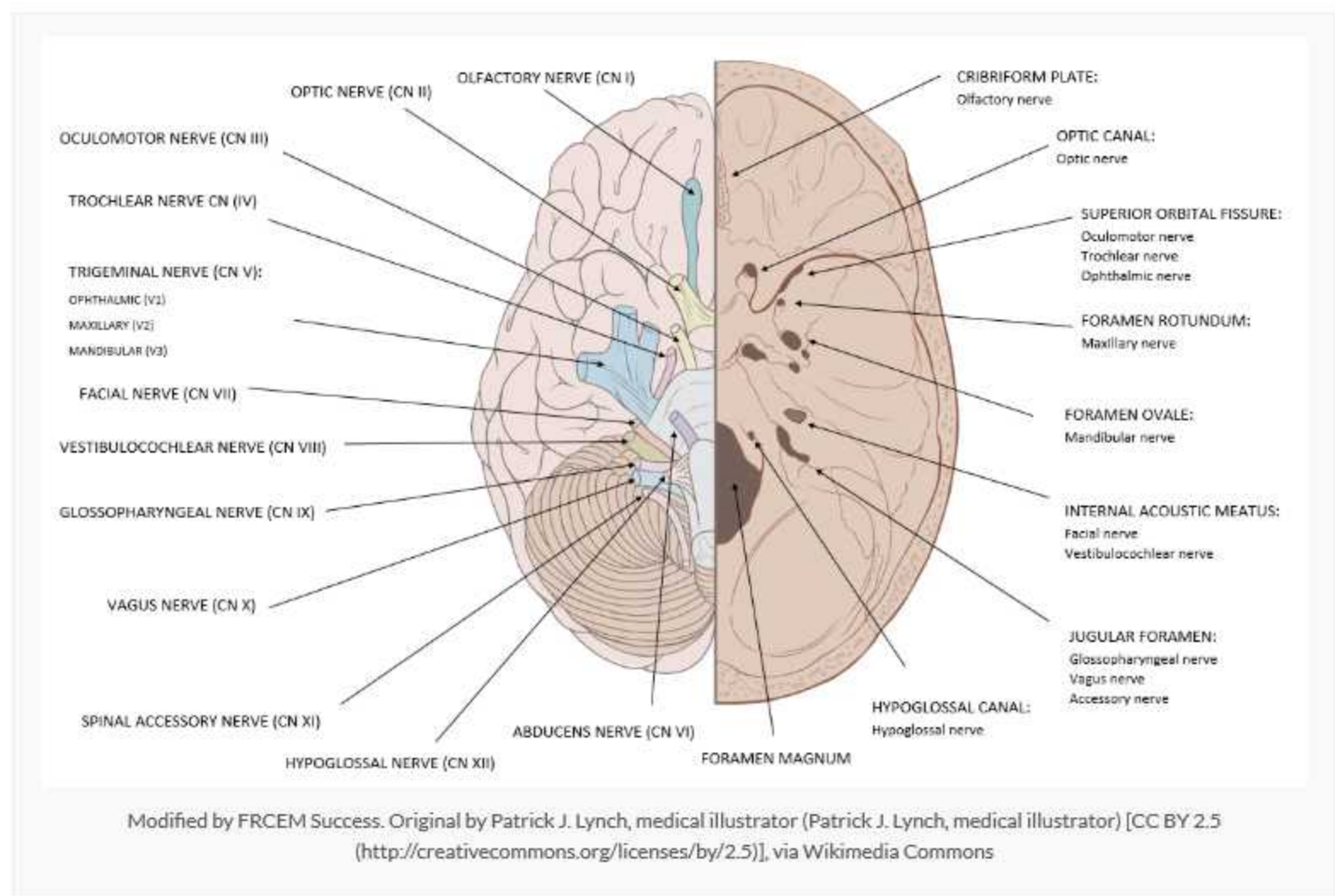
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say 'ahhh' to look for uvula deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvula deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvula will move asymmetrically when the patient says 'ahh' – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

< Previous

Next >

Something wrong?

Question Navigator

- 1 Answered
- 2 Answered
- 3 Answered
- 4 Answered
- 5 Answered
- 6 Answered
- 7 Answered
- 8 Answered
- 9 Answered
- 10 Answered
- 11 Answered
- 12 Current Question

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 13 of 142



Which of the following features is NOT typical of oculomotor (CN III) palsy:

- ☐ a Ptosis
- ☐ b Pupillary dilatation
- ☐ c Accommodation deficit
- ☐ d A depressed and abducted pupil
- ☐ e Loss of abduction

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

13 Current Question

14 ...

15 ...

16 ...

17 ...

18 ...

19 ...

20 ...

21 ...

22 ...

23 ...

24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 13 of 142



Which of the following features is NOT typical of oculomotor (CN III) palsy:

- a) Ptosis
- b) Pupillary dilatation
- c) Accommodation deficit
- d) A depressed and abducted pupil
- e) Loss of abduction

Answer

Loss of abduction results from paralysis of the lateral rectus muscle innervated by the abducens nerve.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

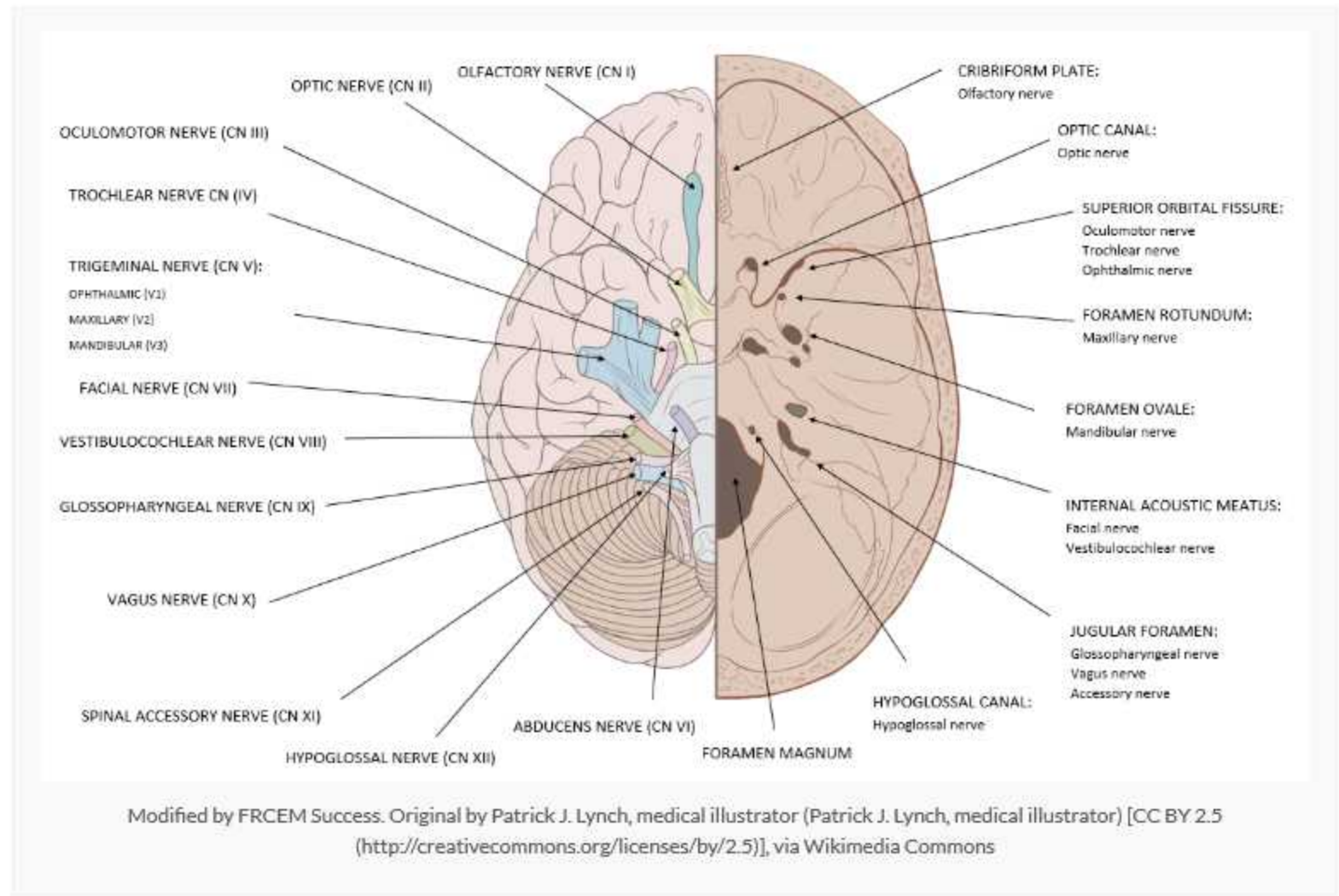
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

- 13 Current Question
- 14 ...
- 15 ...
- 16 ...
- 17 ...
- 18 ...
- 19 ...
- 20 ...
- 21 ...
- 22 ...
- 23 ...
- 24 ...

Anatomy: CNS and CN lesions

Question 14 of 142



Regarding the accessory nerve, which of the following statements is **INCORRECT**:

- ☐ a The nerve originates from cervical segments C1 – C5.
- ☐ b The nerve exits the skull through the jugular foramen.
- ☐ c The accessory nerve innervates the sternocleidomastoid and the trapezius muscle.
- ☐ d Accessory nerve palsy results in the inability to nod the head.
- ☐ e The nerve enters the cranial cavity through the foramen magnum.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

13 Answered

14 Current Question

15 ...

16 ...

17 ...

18 ...

19 ...

20 ...

21 ...

22 ...

23 ...

24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 14 of 142



Regarding the accessory nerve, which of the following statements is INCORRECT:

- a) The nerve originates from cervical segments C1 – C5.
- b) The nerve exits the skull through the jugular foramen.
- c) The accessory nerve innervates the sternocleidomastoid and the trapezius muscle.
- d) Accessory nerve palsy results in the inability to nod the head. ✓
- e) The nerve enters the cranial cavity through the foramen magnum. ✗

Answer

Accessory nerve palsy results in inability to shrug the shoulders and to rotate the head to look at the opposite side to the lesion.

Notes

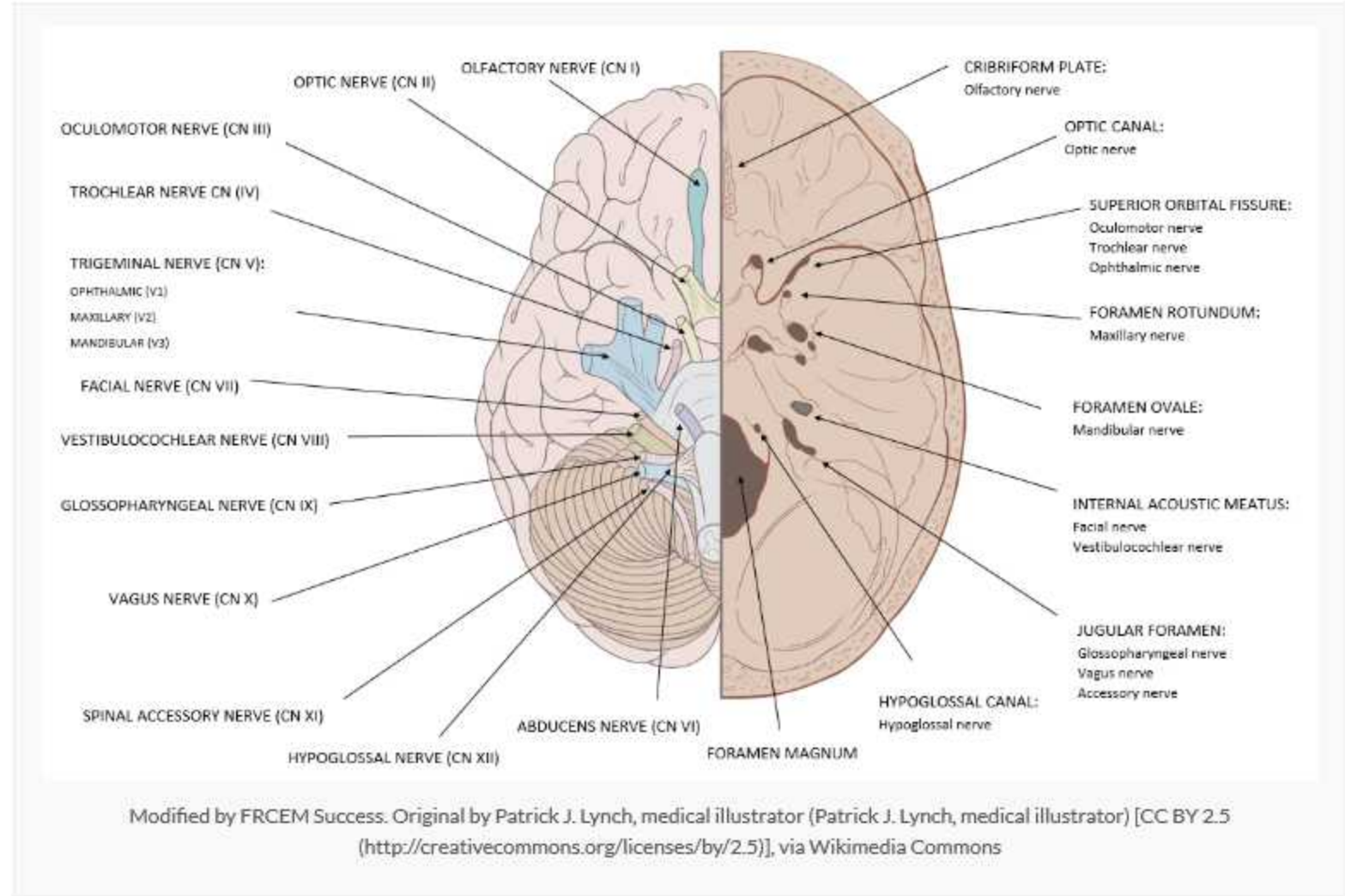
The accessory nerve (CN XI) is a motor nerve innervating the sternocleidomastoid and the trapezius muscles which mediate head and shoulder movement.

Cranial nerve	Spinal accessory nerve (CN XI)
Key anatomy	Originates from cervical segments C1 – C5/C6, enters cranial cavity through foramen magnum, travels through posterior cranial fossa and exits skull through jugular foramen
Function	Motor: sternocleidomastoid, trapezius
Assessment	Test head rotation and shoulder shrug against resistance
Clinical effects of injury	Inability to shrug ipsilateral shoulder, shoulder droop, inability to rotate head towards opposite side to the lesion
Causes of injury	Metastatic lymphadenopathy in neck, neck dissection surgery, internal jugular vein cannulation, blunt or penetrating neck trauma

Key anatomy

It is a unique cranial nerve because its roots actually arise from motor neurons in the upper five segments of the cervical spinal cord. The fibres leave the lateral surface of the spinal cord, joining together as they ascend, and enter the cranial cavity through the foramen magnum forming the accessory nerve. The accessory nerve then continues through the posterior cranial fossa and exits the skull through the jugular foramen before descending in the neck along the internal carotid artery to innervate the muscles.

A few rootlets arising from the medulla just inferior to the fibres that arise to form the vagus nerve, may be referred to as the cranial roots of the accessory nerve. Leaving the medulla these fibres course with the 'spinal' roots of the accessory nerve into the jugular foramen, at which point these cranial roots join the vagus nerve. They are distributed to the pharyngeal musculature innervated by the vagus nerve and are therefore usually described as being part of the vagus nerve.



Assessment

The accessory nerve is examined by asking the patient to rotate their head and shrug their shoulders against resistance.

Clinical implications

Clinical features of CN XI palsy include muscle wasting and paralysis of the sternocleidomastoid and trapezius muscles resulting in the inability to rotate the head to the side opposite the lesion and to shrug the ipsilateral shoulder (resulting in shoulder droop) respectively.

Damage can occur due to:

- Metastatic disease in the neck with lymph node involvement
- Neck dissection surgery
- Cannulation of the internal jugular vein
- Blunt or penetrating neck trauma

< Previous Next >

Something wrong?

Question Navigator

- 13 Answered
- 14 Current Question
- 15 ...
- 16 ...
- 17 ...
- 18 ...
- 19 ...
- 20 ...
- 21 ...
- 22 ...
- 23 ...
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 15 of 142



Which of the following nerves is the efferent pathway of the pupillary light reflex:

- ☐ a Facial nerve
- ☐ b Ophthalmic nerve
- ☐ c Optic nerve
- ☐ d Oculomotor nerve
- ☐ e Abducens nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

13 Answered

14 Answered

15 Current Question

16 ...

17 ...

18 ...

19 ...

20 ...

21 ...

22 ...

23 ...

24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 15 of 142



Which of the following nerves is the efferent pathway of the pupillary light reflex:

- a) Facial nerve
- b) Ophthalmic nerve
- c) Optic nerve
- d) Oculomotor nerve
- e) Abducens nerve

Answer

The oculomotor nerve is the efferent pathway of the pupillary light reflex. The optic nerve is the afferent pathway of the pupillary light reflex.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

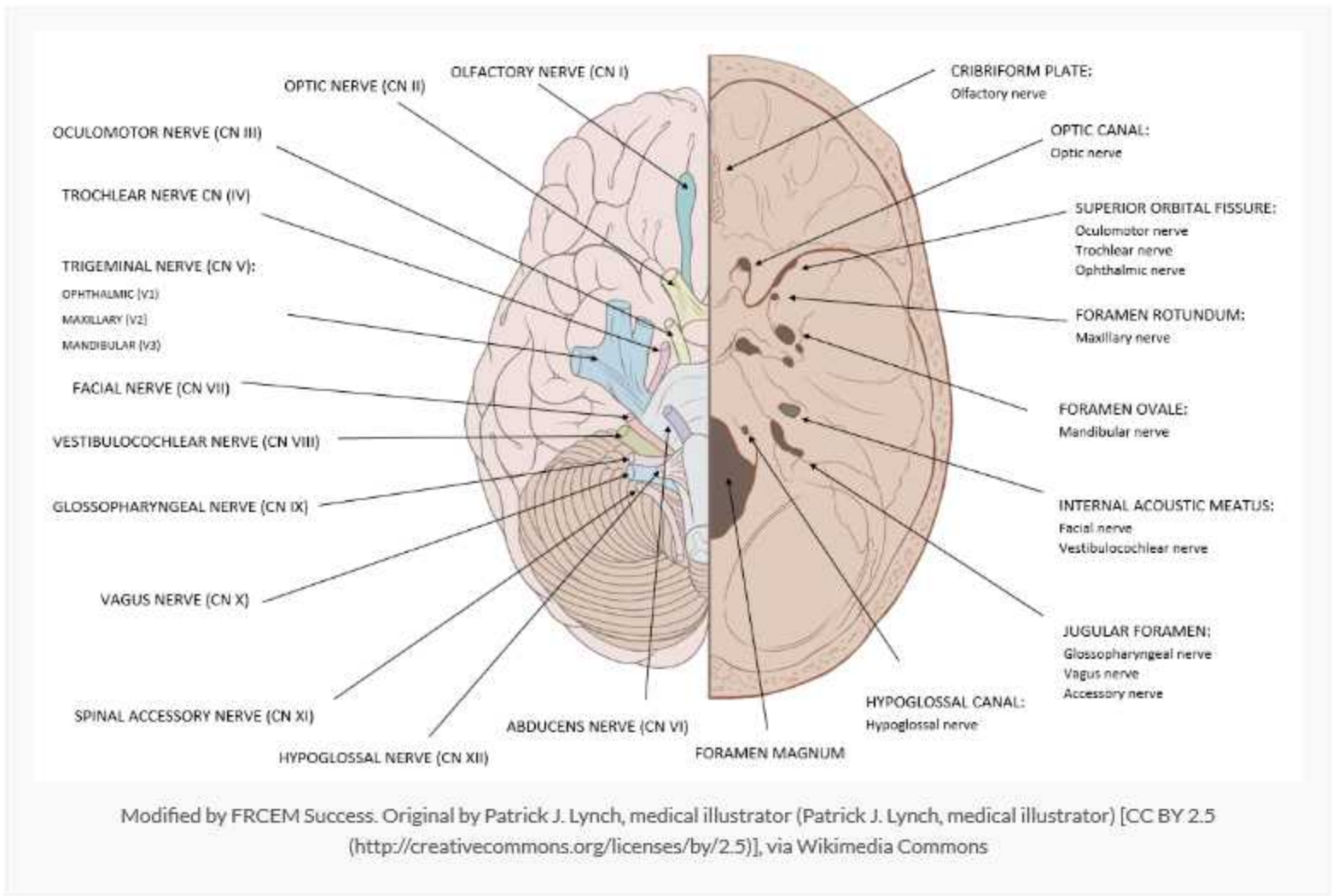
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

13	Answered
14	Answered
15	Current Question
16	...
17	...
18	...
19	...
20	...
21	...
22	...
23	...
24	...

Anatomy: CNS and CN lesions

Question 16 of 142



A 21 year old female presents to ED with isolated facial nerve palsy. You diagnose Bell's palsy. Which of the following clinical features might you expect on examination:

- ☐ a Sensory loss over the cornea and conjunctiva
- ☐ b Loss of the corneal blink reflex
- ☐ c Fixed and dilated pupil
- ☐ d Loss of sensation over the ipsilateral face
- ☐ e Loss of accommodation reflex

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

13 Answered

14 Answered

15 Answered

16 Current Question

17 ...

18 ...

19 ...

20 ...

21 ...

22 ...

23 ...

24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 16 of 142



A 21 year old female presents to ED with isolated facial nerve palsy. You diagnose Bell's palsy. Which of the following clinical features might you expect on examination:

- a) Sensory loss over the cornea and conjunctiva
- b) **Loss of the corneal blink reflex** ✓
- c) Fixed and dilated pupil
- d) Loss of sensation over the ipsilateral face
- e) Loss of accommodation reflex

Answer

The facial nerve innervates the orbicularis oculi, the muscle responsible for closing the eye. The facial nerve is therefore the efferent pathway of the corneal blink reflex. Sensation to the face, and the cornea and conjunctiva is supplied by the trigeminal nerve, which is therefore the afferent pathway of the corneal blink reflex. A fixed dilated pupil, and loss of the accommodation reflex may be seen in palsy of the oculomotor nerve due to loss of innervation of the sphincter pupillae and ciliary muscle respectively.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

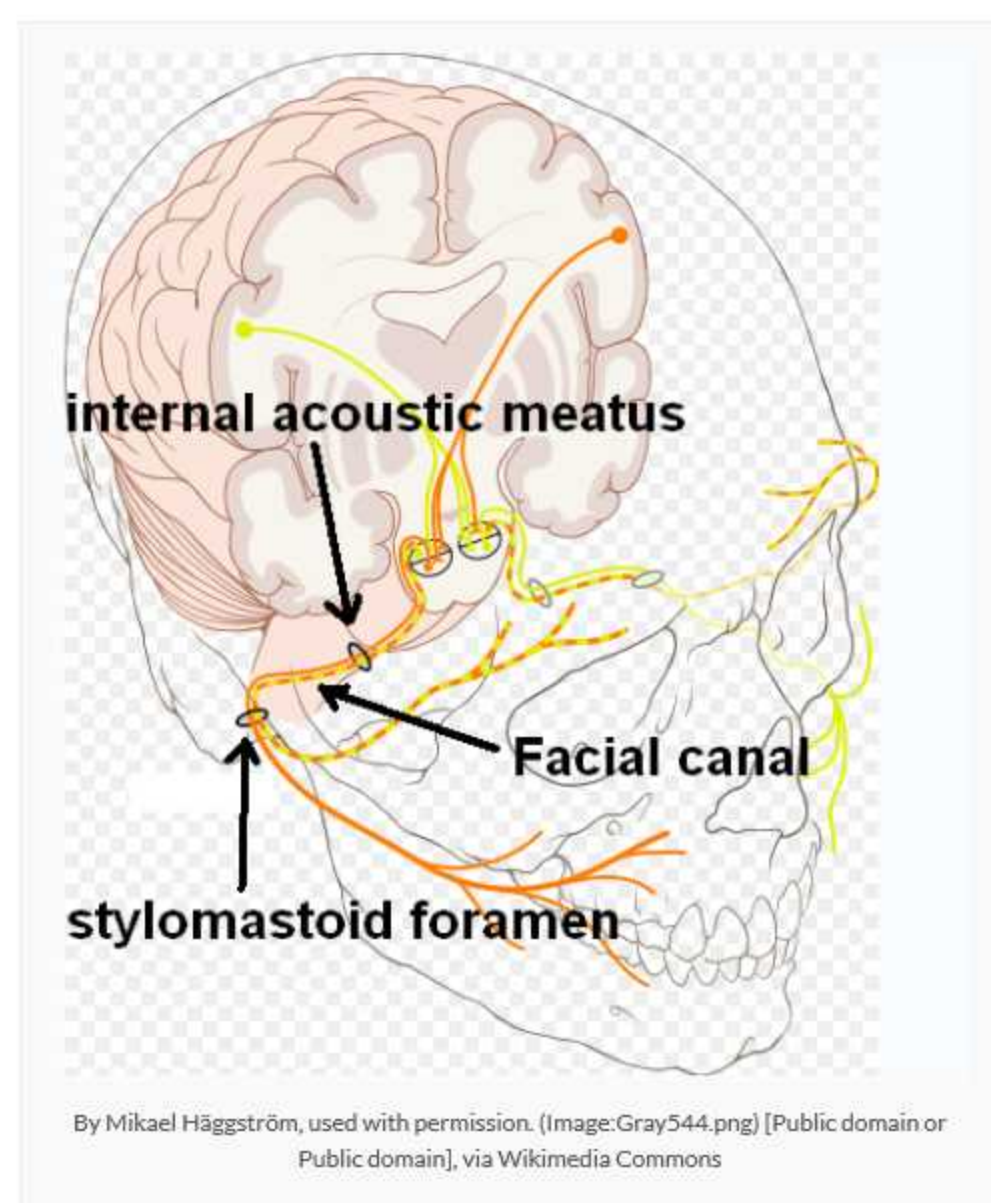
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

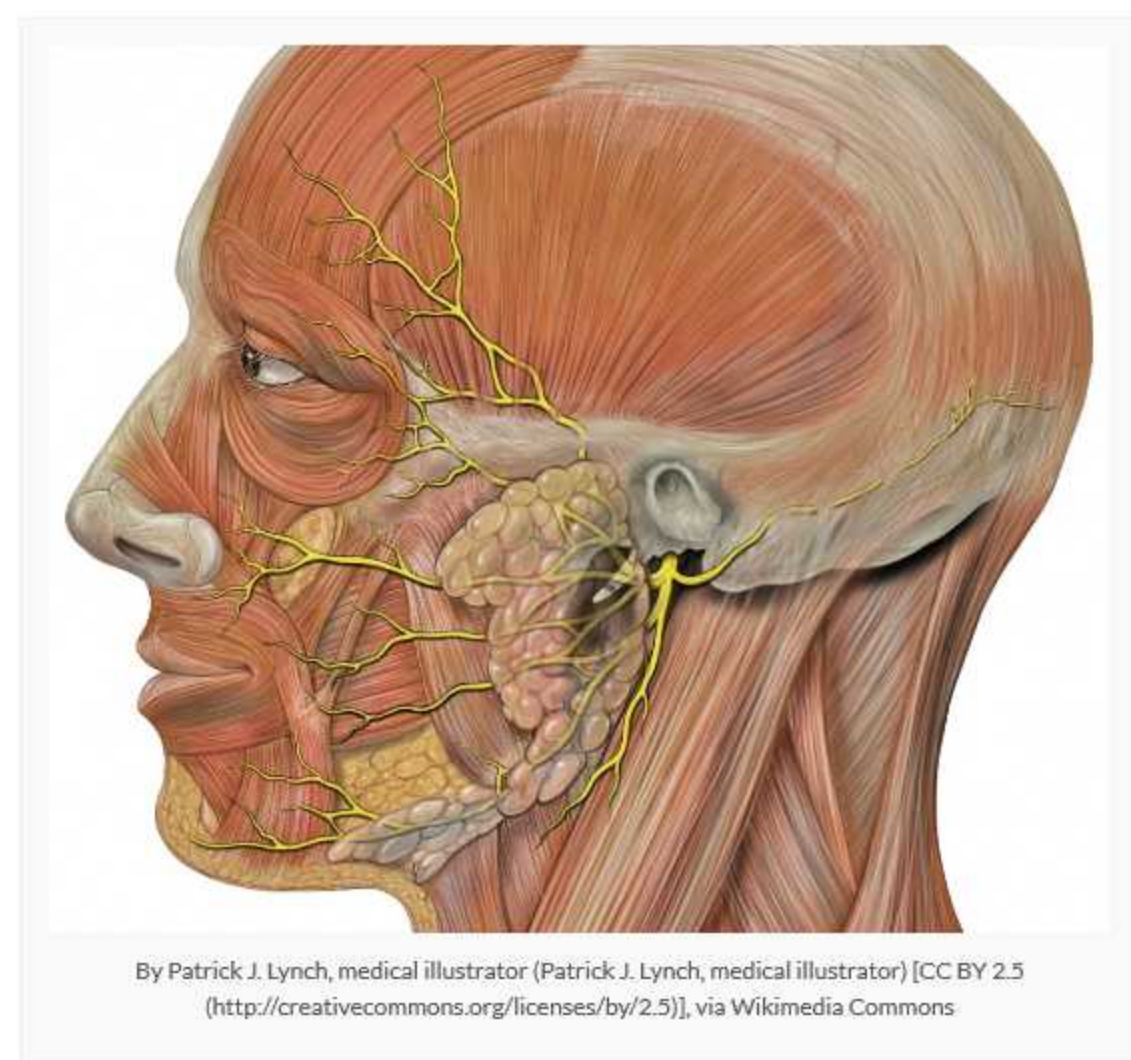
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

< Previous

Next >

Something wrong?

Question Navigator

13	Answered
14	Answered
15	Answered
16	Current Question
17	...
18	...
19	...
20	...
21	...
22	...
23	...
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 17 of 142



Regarding the abducens nerve, which of the following statements is CORRECT:

- ☐ a The abducens nerve innervates the inferior oblique muscle.
- ☐ b Abducens nerve palsy results in a vertical diplopia.
- ☐ c The abducens nerve originates in the medulla.
- ☐ d The abducens nerve enters the orbit through the inferior orbital fissure.
- ☐ e Abducens nerve palsy results in a convergent squint.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Current Question
- 18 ...
- 19 ...
- 20 ...
- 21 ...
- 22 ...
- 23 ...
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Anatomy: CNS and CN lesions

Question 17 of 142

Regarding the abducens nerve, which of the following statements is CORRECT:

- a) The abducens nerve innervates the inferior oblique muscle.
- b) Abducens nerve palsy results in a vertical diplopia.
- c) The abducens nerve originates in the medulla.
- d) The abducens nerve enters the orbit through the inferior orbital fissure.
- e) Abducens nerve palsy results in a convergent squint.

Answer

The abducens nerve originates in the pons and enters the orbit through the superior orbital fissure to innervate the lateral rectus muscle. Abducens nerve palsy results in a convergent squint and horizontal diplopia.

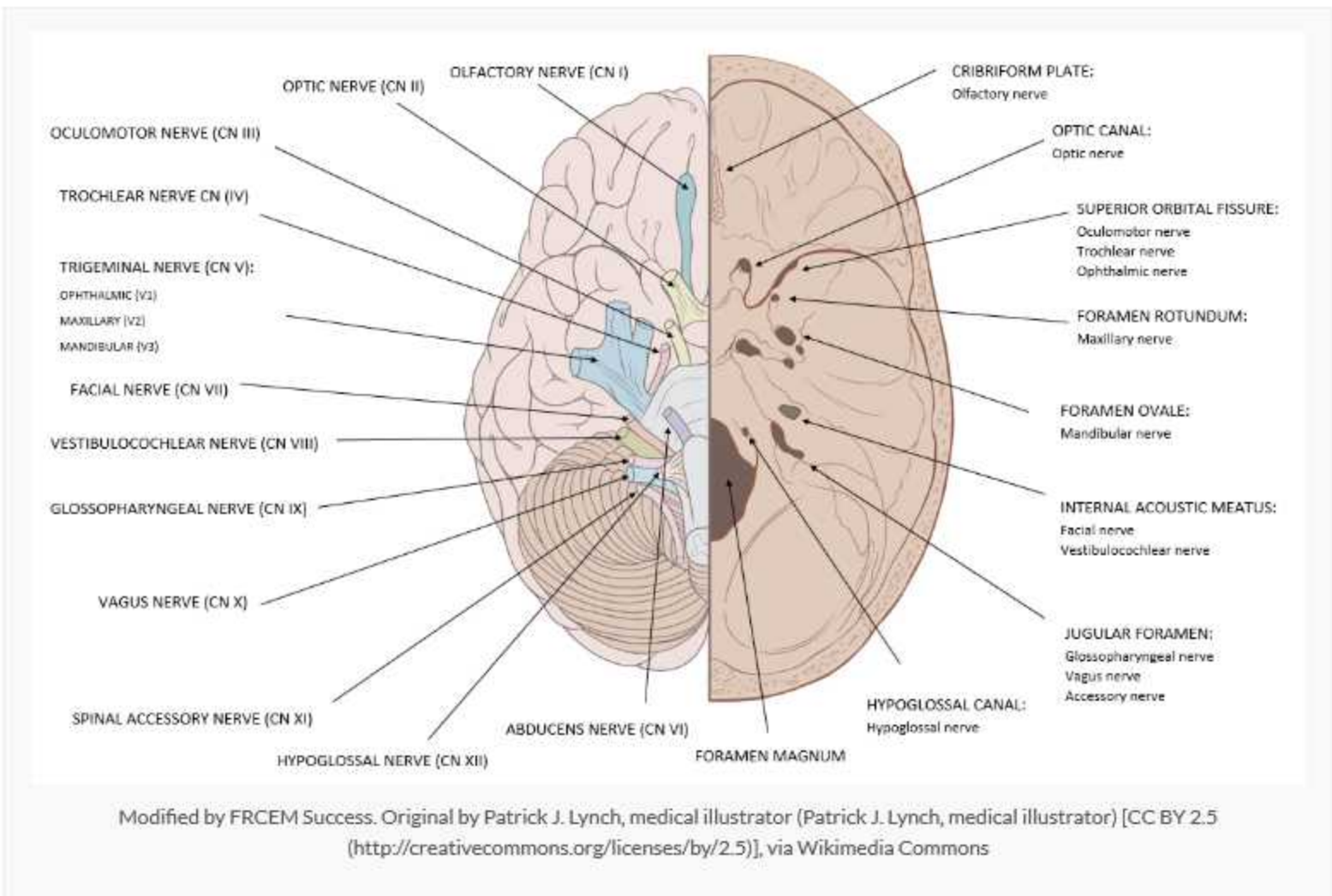
Notes

The abducens nerve (CN VI) is a motor nerve supplying the lateral rectus muscle which acts to abduct the eye.

Cranial nerve	Abducens nerve (CN VI)
Key anatomy	Arises from pons, travels through cavernous sinus, exits skull through superior orbital fissure
Function	Motor: lateral rectus muscle of eye (abducts eye)
Assessment	Eye movements
Clinical effects of injury	Convergent squint with inability to abduct eye, horizontal diplopia
Causes of injury	Idiopathic, brain tumours, extradural haematoma, cavernous sinus disease, diabetes mellitus, Wernicke-Korsakoff syndrome

Anatomical course

The nerve originates in the pons and exits the brainstem from the inferior pontine sulcus to travel in the subarachnoid space. It traverses the cavernous sinus where it runs alongside the internal carotid artery, and enters the orbit through the superior orbital fissure.



Clinical implications

CN VI palsies result in a convergent squint at rest (eye turned inwards) with inability to abduct the eye because of unopposed action of the rectus medialis. The patient complains of horizontal diplopia when looking towards the affected side. With complete paralysis, the eye cannot abduct past the midline.

Causes of CN VI palsy include:

- Idiopathic
- Diabetes, hypertension
- Pontine stroke
- Extradural haematoma
- Demyelination
- Wernicke's encephalopathy
- Giant cell arteritis
- Tumours (e.g. cerebellopontine angle tumours)
- Basilar artery aneurysm
- Cavernous sinus disease
- Infections e.g. subacute meningitis, tuberculosis
- Trauma (up to one-third of cases)

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Current Question
18	...
19	...
20	...
21	...
22	...
23	...
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 18 of 142



The spinal accessory nerve innervates which of the following muscles:

- ☐ a Trapezius and anterior scalene
- ☐ b Sternocleidomastoid and anterior scalene
- ☐ c Sternocleidomastoid and trapezius
- ☐ d Trapezius and latissimus dorsi
- ☐ e Sternocleidomastoid

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Current Question
- 19 ...
- 20 ...
- 21 ...
- 22 ...
- 23 ...
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 18 of 142

The spinal accessory nerve innervates which of the following muscles:

- a) Trapezius and anterior scalene
- b) Sternocleidomastoid and anterior scalene
- c) Sternocleidomastoid and trapezius
- d) Trapezius and latissimus dorsi
- e) Sternocleidomastoid

Answer

The accessory nerve innervates the sternocleidomastoid and the trapezius muscles.

Notes

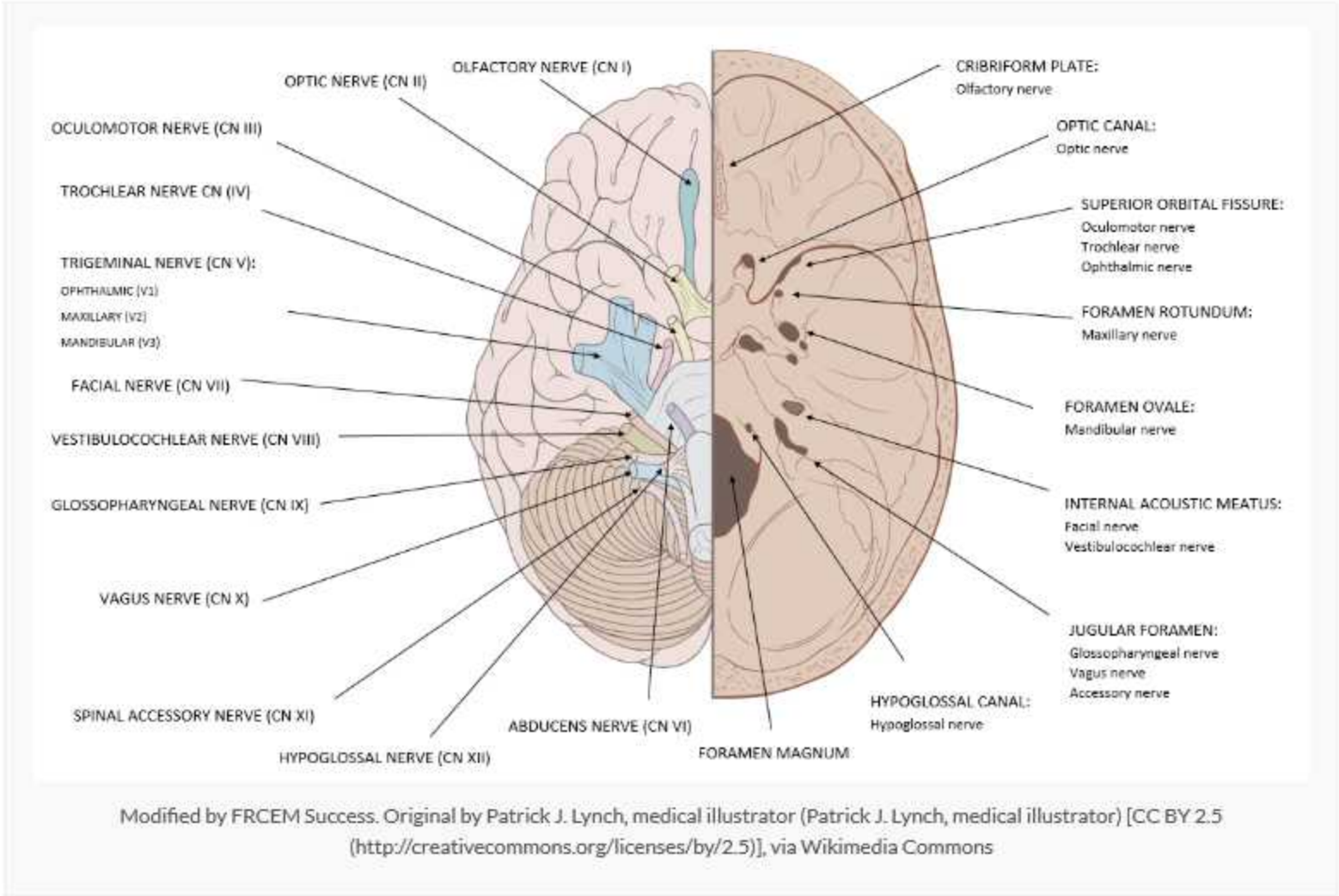
The accessory nerve (CN XI) is a motor nerve innervating the sternocleidomastoid and the trapezius muscles which mediate head and shoulder movement.

Cranial nerve	Spinal accessory nerve (CN XI)
Key anatomy	Originates from cervical segments C1 – C5/C6, enters cranial cavity through foramen magnum, travels through posterior cranial fossa and exits skull through jugular foramen
Function	Motor: sternocleidomastoid, trapezius
Assessment	Test head rotation and shoulder shrug against resistance
Clinical effects of injury	Inability to shrug ipsilateral shoulder, shoulder droop, inability to rotate head towards opposite side to the lesion
Causes of injury	Metastatic lymphadenopathy in neck, neck dissection surgery, internal jugular vein cannulation, blunt or penetrating neck trauma

Key anatomy

It is a unique cranial nerve because its roots actually arise from motor neurons in the upper five segments of the cervical spinal cord. The fibres leave the lateral surface of the spinal cord, joining together as they ascend, and enter the cranial cavity through the foramen magnum forming the accessory nerve. The accessory nerve then continues through the posterior cranial fossa and exits the skull through the jugular foramen before descending in the neck along the internal carotid artery to innervate the muscles.

A few rootlets arising from the medulla just inferior to the fibres that arise to form the vagus nerve, may be referred to as the cranial roots of the accessory nerve. Leaving the medulla these fibres course with the ‘spinal’ roots of the accessory nerve into the jugular foramen, at which point these cranial roots join the vagus nerve. They are distributed to the pharyngeal musculature innervated by the vagus nerve and are therefore usually described as being part of the vagus nerve.



Assessment

The accessory nerve is examined by asking the patient to rotate their head and shrug their shoulders against resistance.

Clinical implications

Clinical features of CN XI palsy include muscle wasting and paralysis of the sternocleidomastoid and trapezius muscles resulting in the inability to rotate the head to the side opposite the lesion and to shrug the ipsilateral shoulder (resulting in shoulder droop) respectively.

Damage can occur due to:

- Metastatic disease in the neck with lymph node involvement
- Neck dissection surgery
- Cannulation of the internal jugular vein
- Blunt or penetrating neck trauma

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Answered
18	Current Question
19	...
20	...
21	...
22	...
23	...
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 19 of 142



What of the following type of visual field defect are you most likely to see in a lesion of optic radiation in the right parietal lobe:

- ☐ a Left homonymous hemianopia
- ☐ b Left homonymous inferior quadrantanopia
- ☐ c Right homonymous inferior quadrantanopia
- ☐ d Left homonymous superior quadrantanopia
- ☐ e Right homonymous superior quadrantanopia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

13 Answered

14 Answered

15 Answered

16 Answered

17 Answered

18 Answered

19 Current Question

20 ...

21 ...

22 ...

23 ...

24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 19 of 142

- What of the following type of visual field defect are you most likely to see in a lesion of optic radiation in the right parietal lobe:
- a) Left homonymous hemianopia
 - b) Left homonymous inferior quadrantanopia
 - c) Right homonymous inferior quadrantanopia
 - d) Left homonymous superior quadrantanopia
 - e) Right homonymous superior quadrantanopia

Answer

The fibres of the upper part of the optic radiation (serving the lower quadrant of the contralateral visual field) pass deep within the parietal lobe.

Notes

The parietal lobe lies between the frontal lobe anteriorly and the occipital lobe posteriorly, from which it is separated by the central sulcus and parieto-occipital sulcus, respectively. It sits superiorly in relation to the temporal lobe, being separated by the lateral sulcus.

Areas of the parietal lobe are responsible for:

- Perceiving and interpreting sensation and proprioception
- Language and calculation of numbers on the dominant hemisphere side
- Integration of somatosensory, visual and auditory information and processing of visuospatial functions (e.g. 2-point discrimination) on the non-dominant hemisphere side

Area	Function	Lesion
Primary somatosensory cortex and somatosensory association cortex	Sensation and proprioception, visuo-spatial perception	Loss of sensation, difficulty distinguishing left from right, sensory neglect, apraxia, loss of hand-eye coordination, tactile agnosia
Arcuate fasciculus	Connects audiovisual association areas with Broca and Wernicke speech areas	Difficulties with reading, writing, naming, maths
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous inferior quadrantanopia

Areas of the parietal lobe

- The primary somatosensory cortex is located in the postcentral gyrus and is concerned with perceiving complex somatosensory stimuli from the contralateral side of the face and body. Together with the somatosensory association cortex, these areas are responsible for sensation and proprioception, and visuo-spatial perception.
- Pathways within the arcuate fasciculus are concerned with language as they connect Broca's area (frontal lobe) with Wernicke's area (temporal lobe).
- The fibres of the upper part of the optic radiation (serving the lower quadrant of the contralateral visual field) pass deep within the parietal lobe.

By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the parietal lobe is from the middle cerebral artery.

By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications:

Damage to the parietal lobe may result in:

- Cortical contralateral sensory loss with loss of proprioception and two-point discrimination
- Apraxia
- Tactile agnosia
- Attention deficits e.g. contralateral hemispatial neglect syndrome (an inability to perceive a contralateral stimulus when two simultaneous sensory stimuli are applied with equal intensity to corresponding sites on opposite sides of the body)
- Visual field defect (contralateral homonymous inferior quadrantanopia)

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Answered
18	Answered
19	Current Question
20	...
21	...
22	...
23	...
24	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 20 of 142



Which of the following best describes the function of the foramen of Monro:

- ☐ a Major site of production of CSF
- ☐ b Connects the lateral ventricles to the third ventricle
- ☐ c Drains CSF into the subarachnoid cisterns
- ☐ d Connects the third ventricle to the fourth ventricle
- ☐ e Connects the right and left lateral ventricles

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Answered
- 19 Answered
- 20 Current Question
- 21 ...
- 22 ...
- 23 ...
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 20 of 142



Which of the following best describes the function of the foramen of Monro:

- a) Major site of production of CSF
- b) Connects the lateral ventricles to the third ventricle ✓
- c) Drains CSF into the subarachnoid cisterns
- d) Connects the third ventricle to the fourth ventricle ✗
- e) Connects the right and left lateral ventricles

Answer

The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

Notes

The ventricles are a set of communicating cavities within the brain that are responsible for the production, transport and removal of cerebrospinal fluid (CSF), which bathes the central nervous system. Total CSF volume is about 130 ml, of which the majority is in the subarachnoid space.

CSF functions

CSF has three main functions:

- 1) Protection – acting as a cushion for the brain
- 2) Buoyancy – reducing the net weight of the brain to prevent excessive pressure on the base of the brain
- 3) Chemical stability – creating the right chemical environment to allow proper functioning of the brain

CSF production

CSF is secreted by the ventricular choroid plexuses, which are vascular conglomerates of capillaries, pial and ependymal cells. The bulk of CSF arises from the plexuses of the lateral ventricles.

CSF transport in the ventricles

In total there are four ventricles; right and left lateral ventricles, the third ventricle and the fourth ventricle. In cross sectional radiology, the midline cavities (third and fourth ventricles and the aqueduct) are symmetrical, but the lateral ventricles (the cavities of the hemispheres) are not.

The lateral ventricles are C-shaped cavities located within their respective hemispheres of the cerebrum. They are divided into a body, an anterior horn (projecting into the frontal lobe), an inferior horn (projecting into the temporal lobe) and a posterior horn (projecting into the occipital lobe). The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

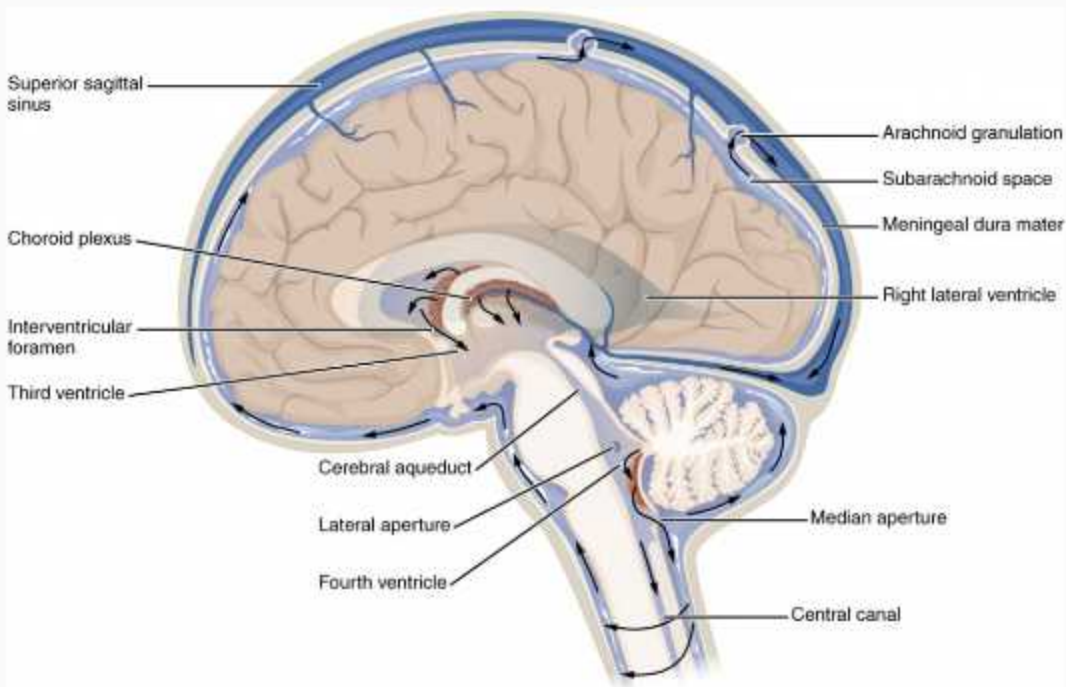
The third ventricle is a slit-like space in the sagittal plane, situated between the right and left thalamus and superior to the hypothalamus. The third ventricle is connected to the fourth ventricle by the cerebral aqueduct.

The fourth ventricle lies within the brainstem, at the junction between the pons and the medulla oblongata.

By BruceBlaus (Own work) [CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons

CSF removal

From the fourth ventricle, the CSF drains into the central spinal canal (bathing the spinal cord) and the subarachnoid cisterns in the subarachnoid space located between the arachnoid mater and pia mater (bathing the brain). From the subarachnoid cisterns, CSF is reabsorbed via arachnoid granulations which protrude into the dura mater, into the dural venous sinuses and from here back into the circulation.



By OpenStax [CC BY 4.0 (http://creativecommons.org/licenses/by/4.0)], via Wikimedia Commons

There is small but significant CSF drainage via the cribriform plate of the ethmoid into the nasal tissues. Fracture of the cribriform plate results in CSF rhinorrhoea.

< Previous

Next >

Something wrong?

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Answered
18	Answered
19	Answered
20	Current Question
21	...
22	...
23	...
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 21 of 142



The vertebral artery is a branch of which of the following blood vessels:

- ☐ a Internal carotid artery
- ☐ b External carotid artery
- ☐ c Subclavian artery
- ☐ d Brachiocephalic trunk
- ☐ e Thyrocervical trunk

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Answered
- 19 Answered
- 20 Answered
- 21 Current Question
- 22 ...
- 23 ...
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 21 of 142

The vertebral artery is a branch of which of the following blood vessels:

- a) Internal carotid artery
- b) External carotid artery
- c) Subclavian artery
- d) Brachiocephalic trunk
- e) Thyrocervical trunk

Answer

The vertebral artery is a branch of the subclavian artery.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

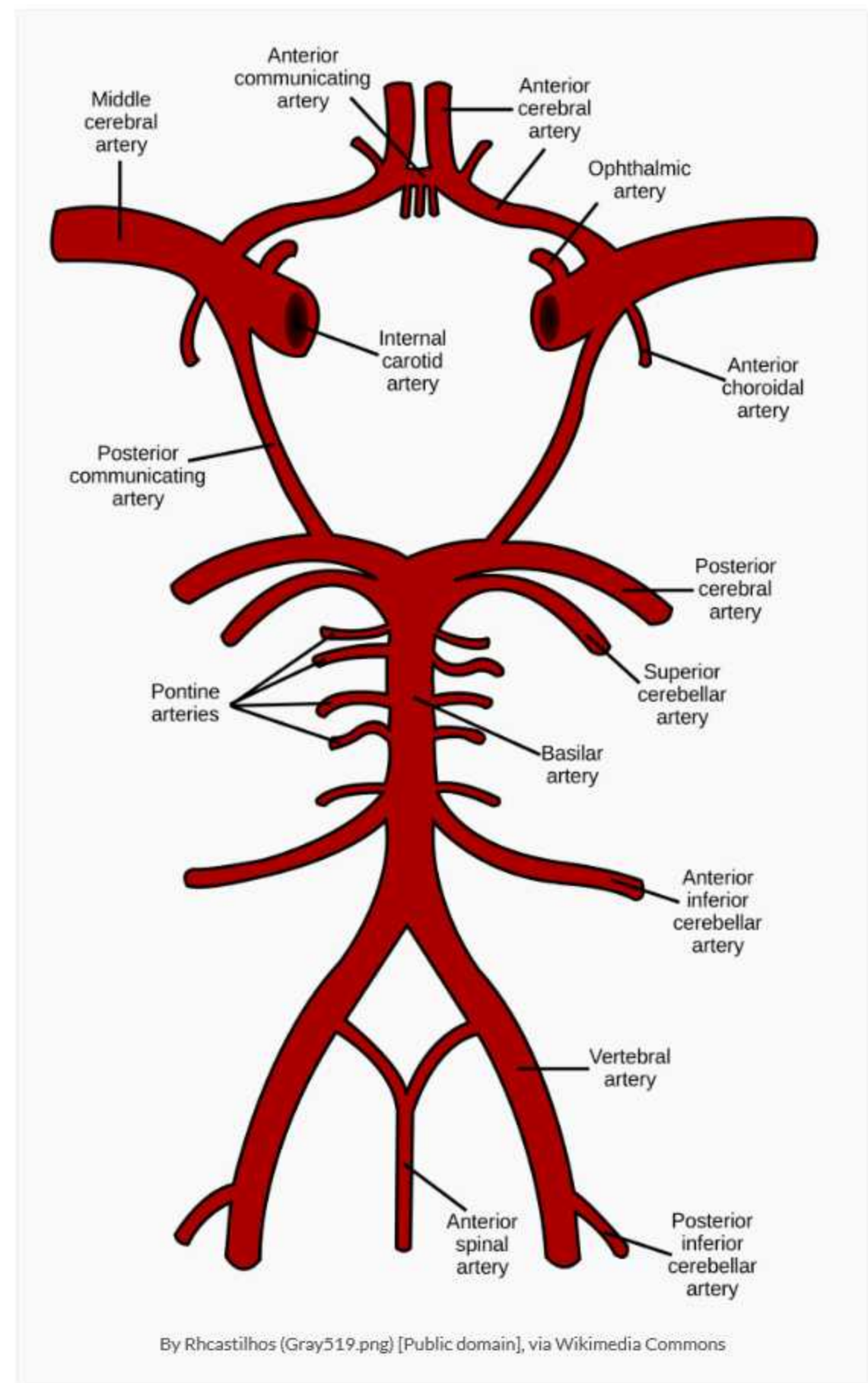
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebral artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

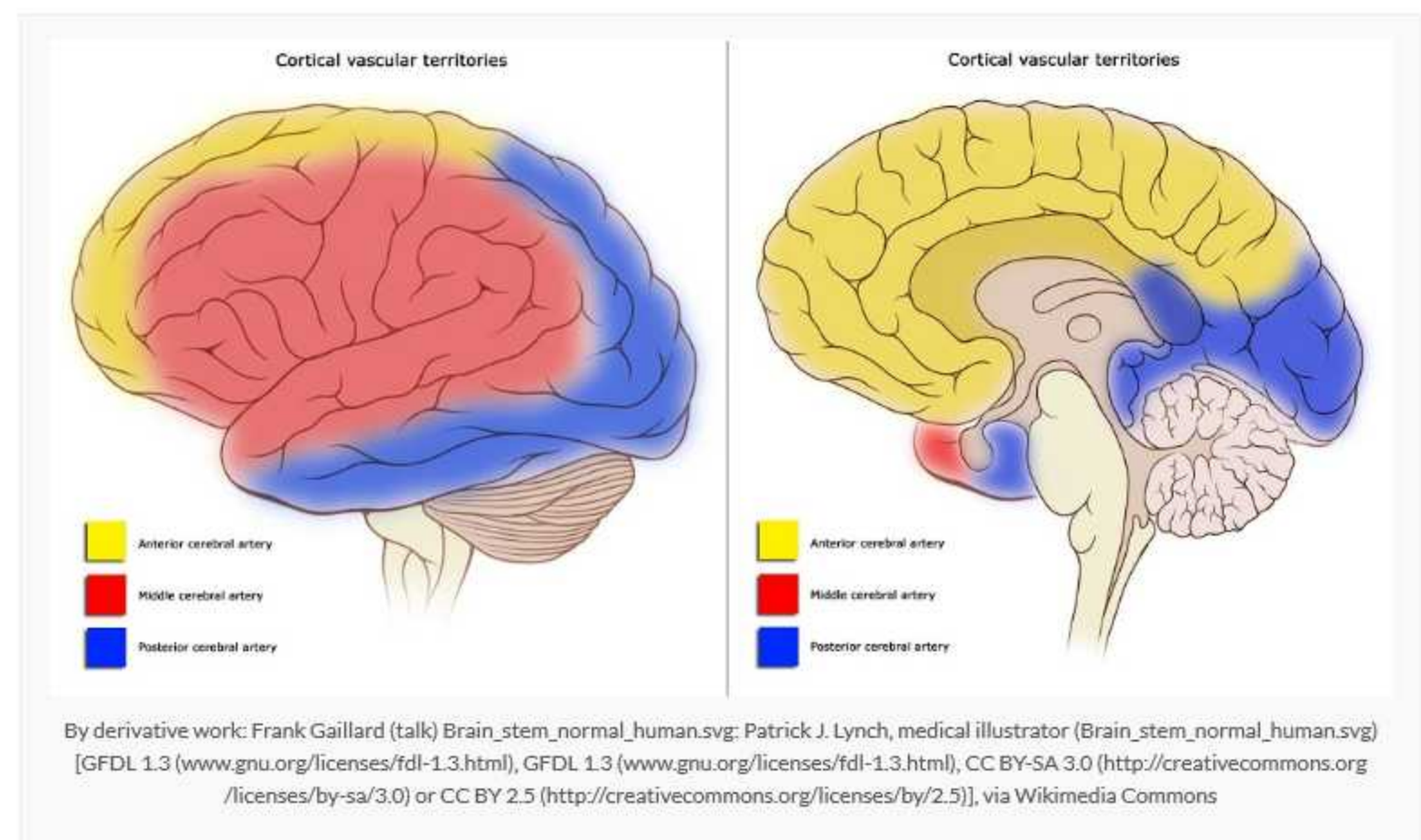
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change• PARIETAL LOBE: contralateral somatosensory loss in the lower limb• CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood• TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia• PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia• N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none">• OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral)• TEMPORAL LOBE: confusion, memory deficit• OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



< Previous

Next >

Something wrong?

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Answered
18	Answered
19	Answered
20	Answered
21	Current Question
22	...
23	...
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 22 of 142

The primary auditory cortex is located in which of the following regions:



- ☐ a Occipital lobe
- ☐ b Parietal lobe
- ☐ c Frontal lobe
- ☐ d Temporal lobe
- ☐ e Brainstem

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Answered
- 19 Answered
- 20 Answered
- 21 Answered
- 22 Current Question
- 23 ...
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 22 of 142

The primary auditory cortex is located in which of the following regions:

- a) Occipital lobe
- b) Parietal lobe
- c) Frontal lobe
- d) Temporal lobe
- e) Brainstem

Answer

The primary auditory cortex is located in the temporal lobe. The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.

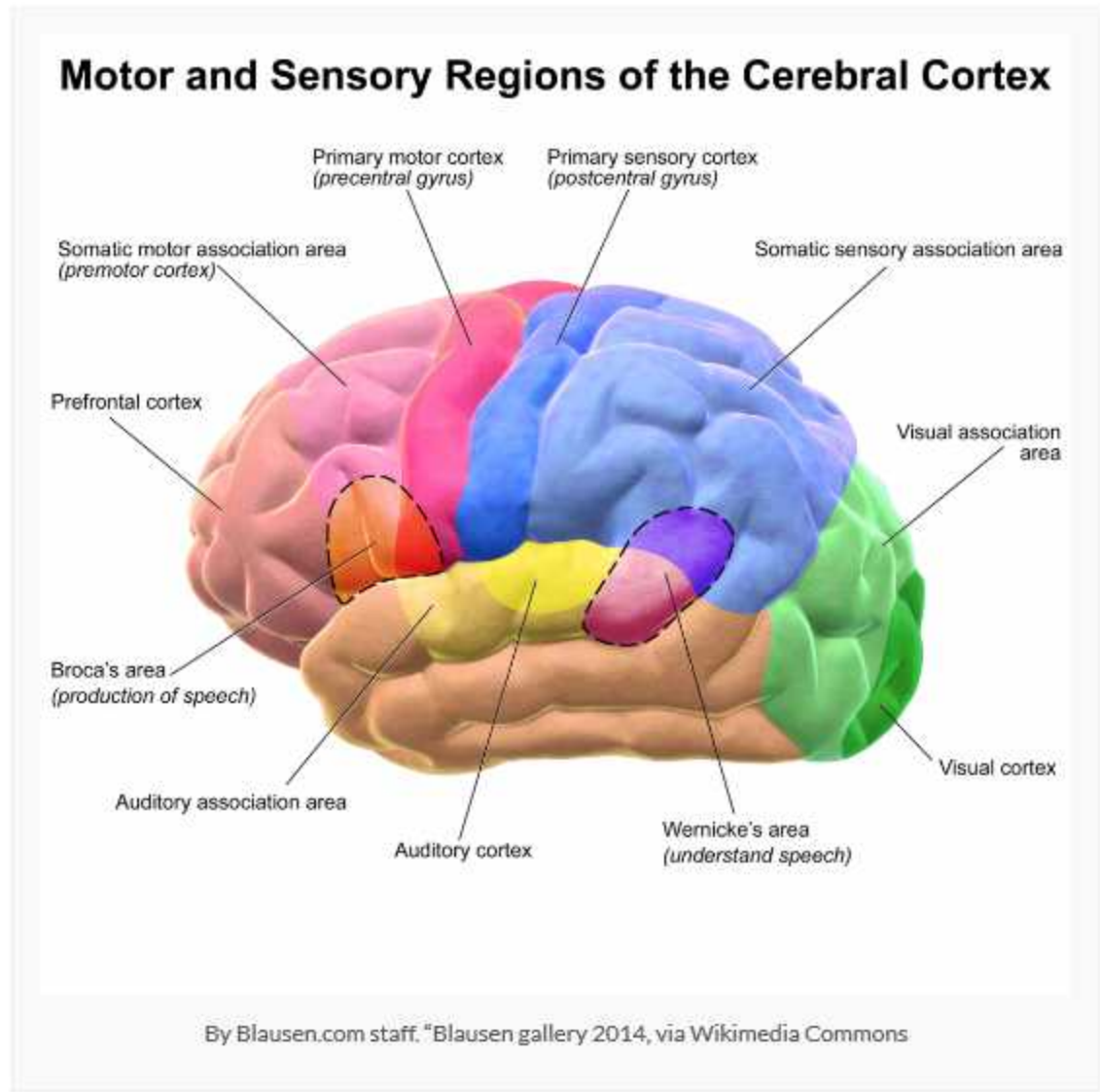
Notes

The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the frontal and parietal lobes, from which it is separated by the lateral sulcus.

Area	Function	Lesion
Wernicke speech area	Language comprehension	Receptive dysphasia
Primary auditory cortex and auditory association area	Perception and recognition of auditory stimuli	Partial cortical deafness, auditory agnosia
Limbic association cortex	Memory, learning, emotion	Memory impairment, increased aggression, difficulty recognising faces/objects
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous superior quadrantanopia

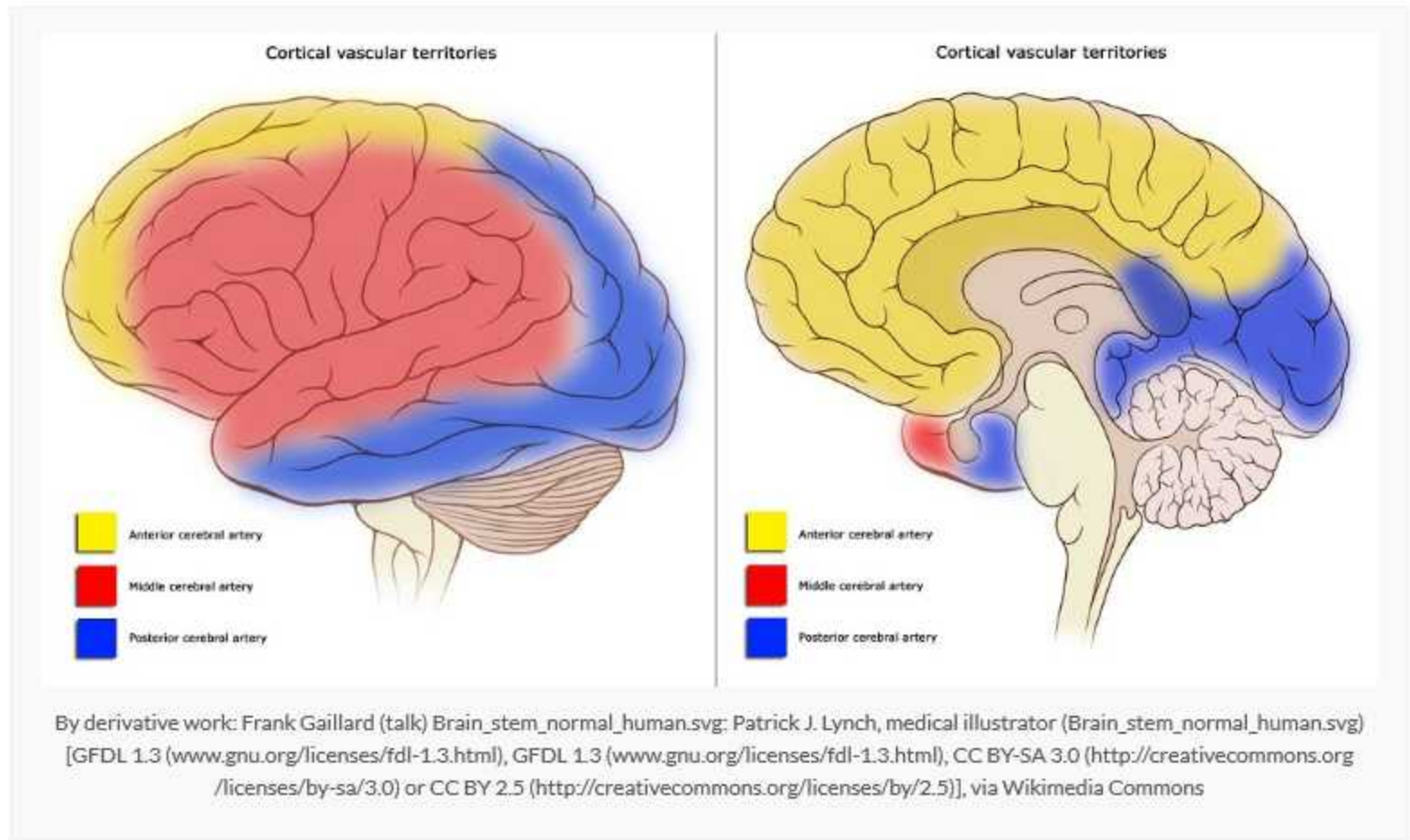
Areas of the temporal lobe

- The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. It is connected to the Broca speech area by the arcuate fasciculus.
- The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.
- The limbic association cortex is important in memory, learning and emotion.
- The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.



Blood supply

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).



Clinical implications

Damage to the temporal lobe may result in:

- Receptive dysphasia – damage to the Wernicke speech area
- Visual field defect (contralateral homonymous superior quadrantanopia) – damage to the optic radiation
- Memory impairment – damage to the limbic system
- Emotional and behavioural disturbances – damage to the limbic system
- Auditory agnosia – damage to the primary auditory cortex or auditory association areas
- Partial cortical deafness (due to bilateral cochlear representation) – damage to the primary auditory cortex

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Answered
18	Answered
19	Answered
20	Answered
21	Answered
22	Current Question
23	...
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 23 of 142



Which of the following is NOT a typical feature of a lesion to the vestibulocochlear nerve:

- ☐ a Hyperacusis
- ☐ b Nystagmus
- ☐ c Impaired hearing
- ☐ d Vertigo
- ☐ e Tinnitus

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Answered
- 19 Answered
- 20 Answered
- 21 Answered
- 22 Answered
- 23 Current Question
- 24 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 23 of 142

Which of the following is NOT a typical feature of a lesion to the vestibulocochlear nerve:

- a) Hyperacusis
- b) Nystagmus
- c) Impaired hearing
- d) Vertigo
- e) Tinnitus

Answer

Hyperacusis may result from paralysis of the stapedius muscle, innervated by the facial nerve.

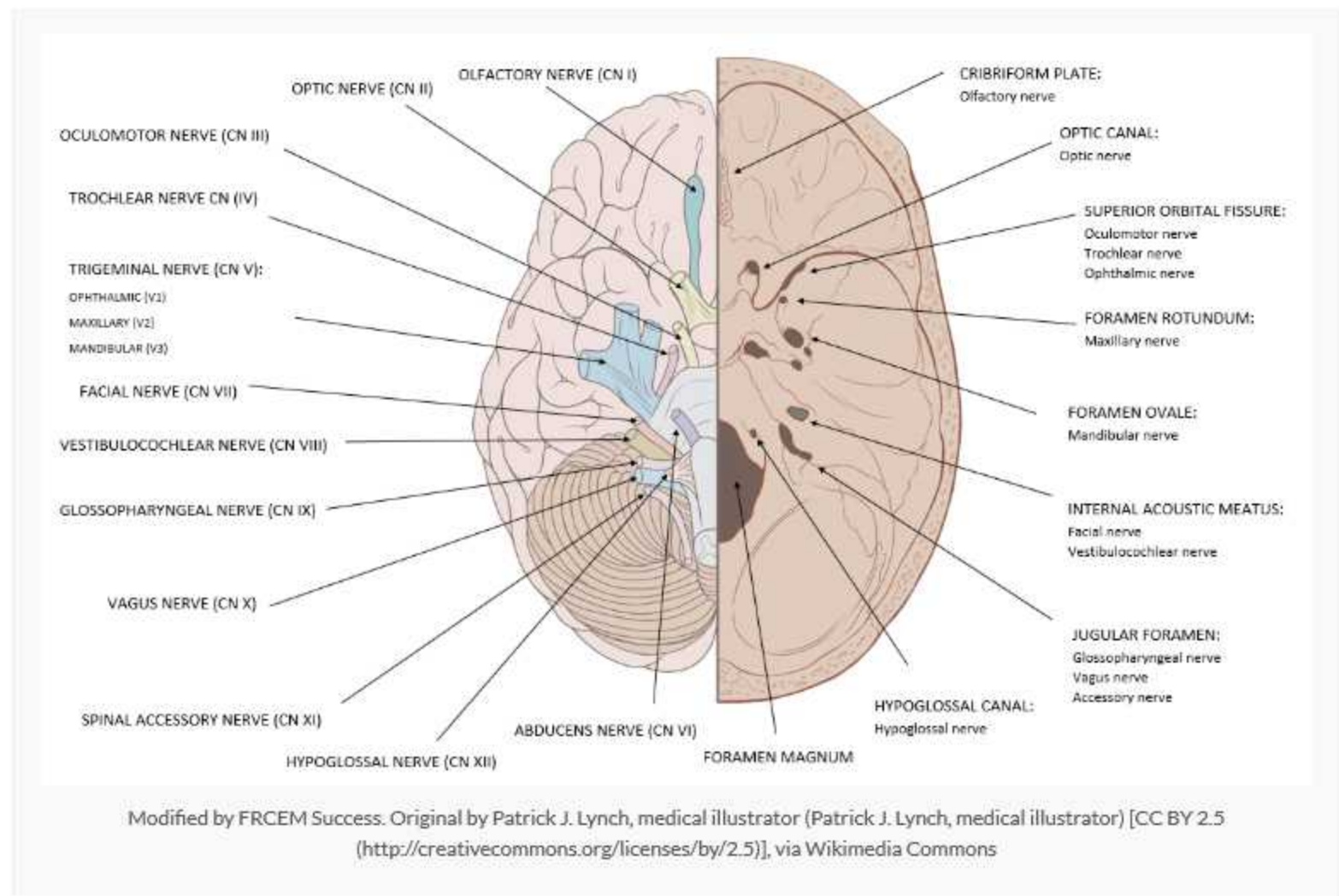
Notes

The vestibulocochlear nerve (CN VIII) is a sensory nerve which transmits sensory information regarding head position and movement via the vestibular nerve, and regarding the reception of sound via the cochlear nerve.

Cranial nerve	Vestibulocochlear nerve (CN VIII)
Key anatomy	Comprised of vestibular and cochlear components which combine in the pons, emerges from the brainstem at the cerebellopontine angle, enters internal acoustic meatus of temporal bone
Function	Sensory: hearing and balance
Assessment	Hearing, Weber and Rinne tests
Clinical effects of injury	Sensorineural deafness, tinnitus, vertigo, loss of equilibrium, nystagmus
Causes of injury	Infection, cerebellopontine angle tumours, basal skull fracture, drugs

Key anatomy

The vestibulocochlear nerve is comprised of two parts. The vestibular and cochlear component combine in the pons to form the vestibulocochlear nerve which emerges from the brainstem at the cerebellopontine angle to enter the internal acoustic meatus of the temporal bone. Within the distal aspect of the internal acoustic meatus, the vestibulocochlear nerve splits, forming the vestibular nerve innervating the vestibular system and the cochlear nerve innervating the cochlear.



Assessment

Hearing should be assessed grossly by whispering numbers and asking the patient to repeat it and by performing Rinne and Weber tests which aim to differentiate between conductive and sensorineural hearing loss. N.B. (AC = air conduction, BC = bone conduction)

Hearing Tests	Weber’s test	Rinne’s test
Screening test	Tests for and distinguishes between conductive and sensorineural deafness in unilateral hearing loss. 512 Hz tuning fork is placed in the middle of the forehead. The patient is asked to report in which ear the sound is heard loudest.	Assesses for the presence of conductive hearing loss in each ear. 512 Hz tuning fork is placed initially on the mastoid process behind each ear until sound is no longer heard (BC), and then placed immediately just outside the ear (AC) with the patient asked to report when the sound is no longer heard.
Normal hearing	Normally sound is heard equally in both ears.	Normally, AC time is longer and louder than BC (AC > BC, Rinne positive).
Unilateral conductive deafness	Sound lateralises to the affected ear.	In the affected ear BC > AC (Rinne negative).
Unilateral sensorineural deafness	Sound lateralises to the normal ear.	In the affected ear AC > BC (Rinne positive).

Clinical implications

Damage to the vestibulocochlear nerve results in (ipsilateral):

- Sensorineural deafness
- Tinnitus
- Loss of equilibrium
- Nystagmus
- Vertigo

Possible causes of damage to the vestibulocochlear nerve include:

- Infections e.g. vestibular neuritis, mastoiditis and herpes zoster
- Cerebellopontine angle tumours (85% are acoustic neuromas, others include meningiomas, cholesteatomas and primary malignancies of the posterior fossa)
- Tumours invading the temporal bone e.g. brainstem glioma
- Vascular malformations at the cerebellopontine angle
- Drugs e.g. aspirin, furosemide, phenytoin, cytotoxics, alcohol
- Paget’s disease
- Fracture of the petrous temporal bone
- Basal skull fracture

Question Navigator

13	Answered
14	Answered
15	Answered
16	Answered
17	Answered
18	Answered
19	Answered
20	Answered
21	Answered
22	Answered
23	Current Question
24	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 24 of 142



The blood supply to the temporal lobe is primarily supplied by which of the following arteries:

- ☐ a Basilar artery
- ☐ b Middle cerebral artery
- ☐ c Posterior cerebral artery
- ☐ d Anterior and middle cerebral artery
- ☐ e Middle and posterior cerebral artery

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Answered
- 19 Answered
- 20 Answered
- 21 Answered
- 22 Answered
- 23 Answered
- 24 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 24 of 142

The blood supply to the temporal lobe is primarily supplied by which of the following arteries:

- a) Basilar artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Anterior and middle cerebral artery
- e) Middle and posterior cerebral artery

Answer

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).

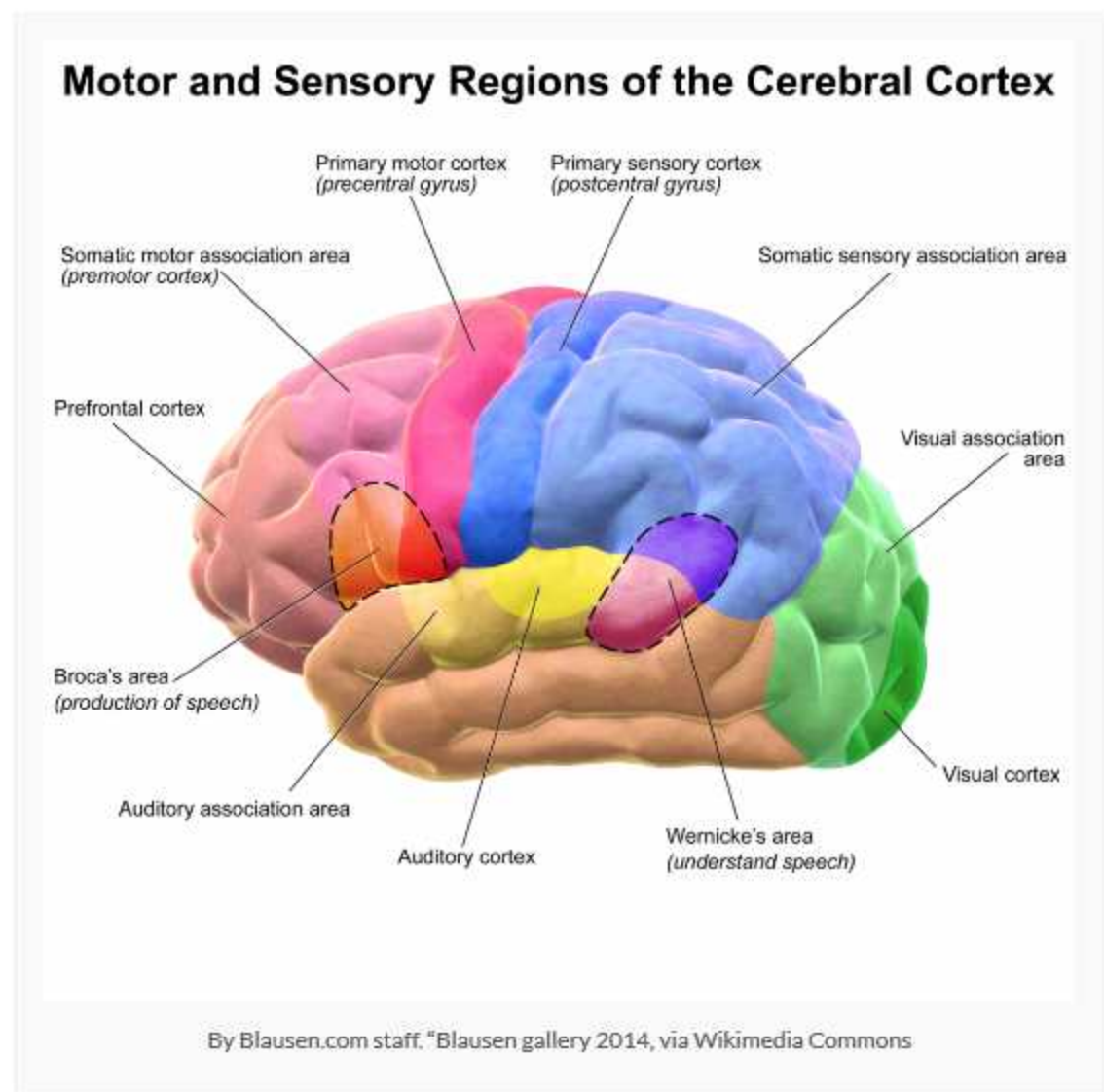
Notes

The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the frontal and parietal lobes, from which it is separated by the lateral sulcus.

Area	Function	Lesion
Wernicke speech area	Language comprehension	Receptive dysphasia
Primary auditory cortex and auditory association area	Perception and recognition of auditory stimuli	Partial cortical deafness, auditory agnosia
Limbic association cortex	Memory, learning, emotion	Memory impairment, increased aggression, difficulty recognising faces/objects
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous superior quadrantanopia

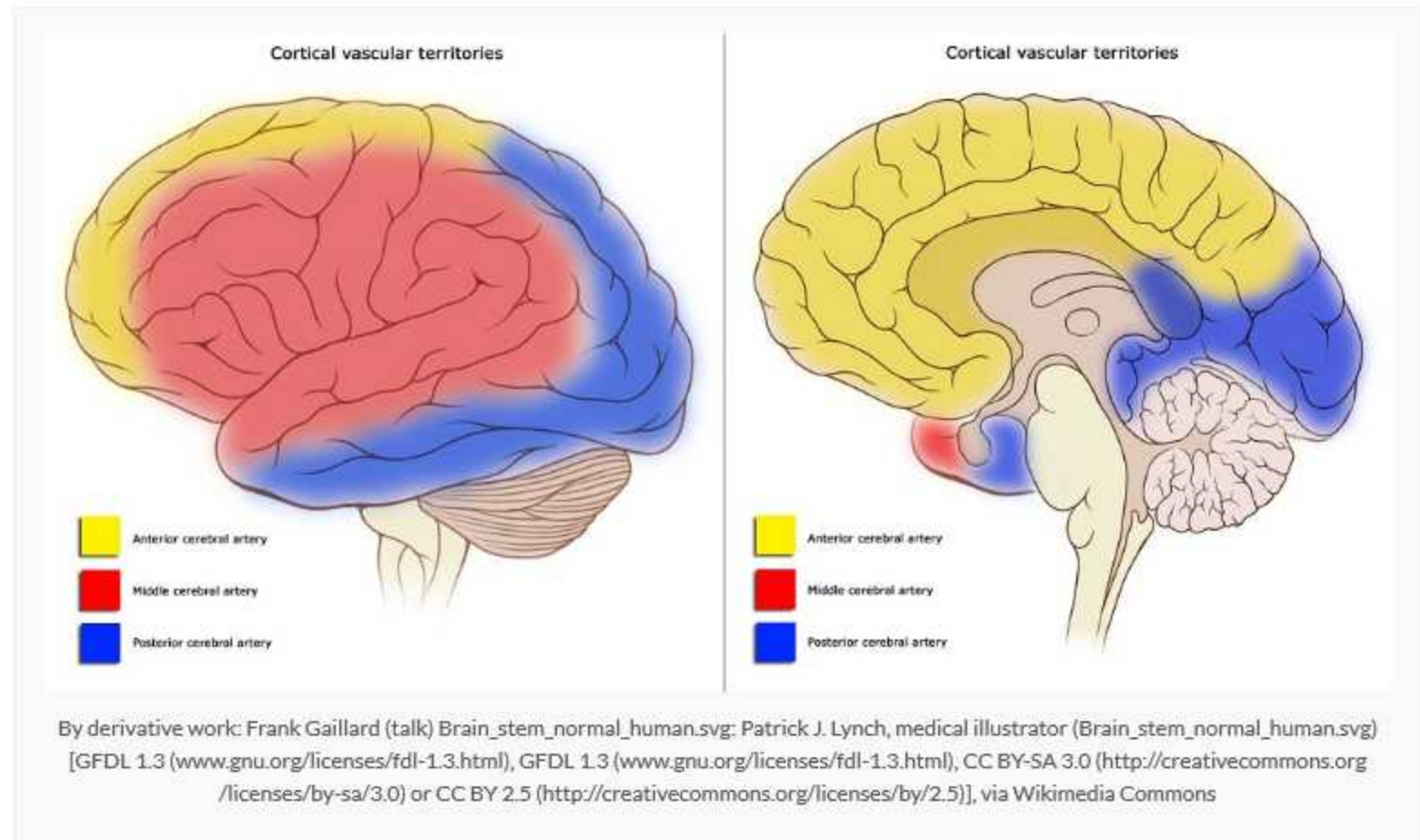
Areas of the temporal lobe

- The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. It is connected to the Broca speech area by the arcuate fasciculus.
- The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.
- The limbic association cortex is important in memory, learning and emotion.
- The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.



Blood supply

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).



Clinical implications

Damage to the temporal lobe may result in:

- Receptive dysphasia – damage to the Wernicke speech area
- Visual field defect (contralateral homonymous superior quadrantanopia) – damage to the optic radiation
- Memory impairment – damage to the limbic system
- Emotional and behavioural disturbances – damage to the limbic system
- Auditory agnosia – damage to the primary auditory cortex or auditory association areas
- Partial cortical deafness (due to bilateral cochlear representation) – damage to the primary auditory cortex

Question Navigator

- 13 Answered
- 14 Answered
- 15 Answered
- 16 Answered
- 17 Answered
- 18 Answered
- 19 Answered
- 20 Answered
- 21 Answered
- 22 Answered
- 23 Answered
- 24 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Rad'opaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 25 of 142



A 31 year old male presents to ED with a head injury. Rhinorrhoea will most likely result from fracture of which of the following bones:

- ☒ a Frontal
- ☐ b Lacrimal
- ☐ c Nasal
- ☐ d Ethmoid
- ☐ e Palatine

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

24 Answered

25 Current Question

26 ...

27 ...

28 ...

29 ...

30 ...

31 ...

32 ...

33 ...

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk





- a) Frontal
- b) Lacrimal
- c) Nasal
- d) **Ethmoid** 
- e) Palatine

©2014 - 2017 FRCM Success | Website designed & hosted by Cyberfrog Design

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 26 of 142

A patient complains of headaches and dizziness. Imaging reveals a tumour at the cerebellopontine angle. Which of the following nerves will most likely be affected by this tumour:



- ☐ a Vagus nerve
- ☐ b Hypoglossal nerve
- ☐ c Vestibulocochlear nerve
- ☐ d Trigeminal nerve
- ☐ e Oculomotor nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

24 Answered

25 Answered

26 Current Question

27 ...

28 ...

29 ...

30 ...

31 ...

32 ...

33 ...

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 26 of 142

A patient complains of headaches and dizziness. Imaging reveals a tumour at the cerebellopontine angle. Which of the following nerves will most likely be affected by this tumour:

- a) Vagus nerve
- b) Hypoglossal nerve
- c) Vestibulocochlear nerve
- d) Trigeminal nerve
- e) Oculomotor nerve

Answer

The vestibulocochlear nerve and facial nerve both emerge from the brainstem at the cerebellopontine angle so are the nerves most likely to be affected by a tumour in this location.

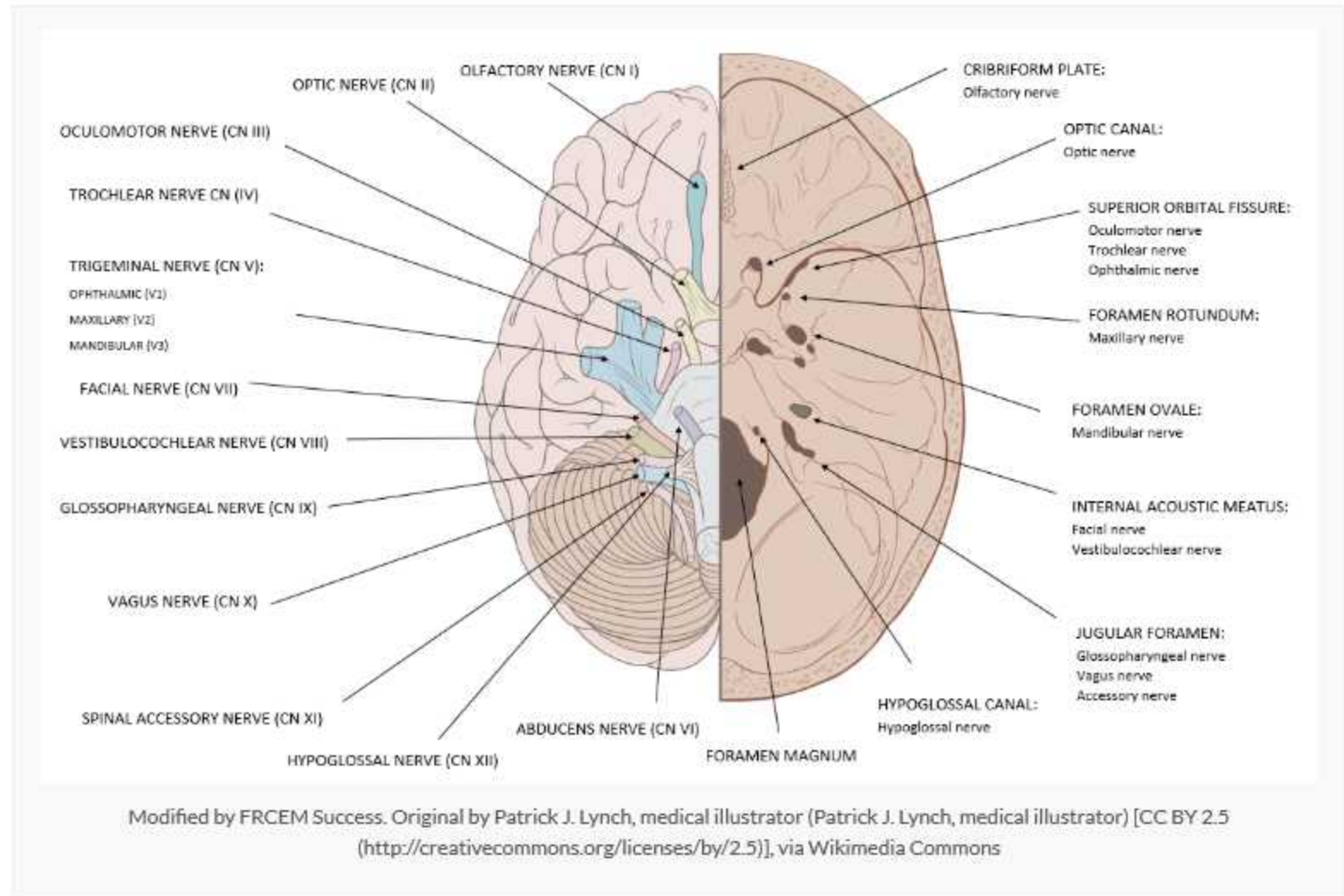
Notes

The vestibulocochlear nerve (CN VIII) is a sensory nerve which transmits sensory information regarding head position and movement via the vestibular nerve, and regarding the reception of sound via the cochlear nerve.

Cranial nerve	Vestibulocochlear nerve (CN VIII)
Key anatomy	Comprised of vestibular and cochlear components which combine in the pons, emerges from the brainstem at the cerebellopontine angle, enters internal acoustic meatus of temporal bone
Function	Sensory: hearing and balance
Assessment	Hearing, Weber and Rinne tests
Clinical effects of injury	Sensorineural deafness, tinnitus, vertigo, loss of equilibrium, nystagmus
Causes of injury	Infection, cerebellopontine angle tumours, basal skull fracture, drugs

Key anatomy

The vestibulocochlear nerve is comprised of two parts. The vestibular and cochlear component combine in the pons to form the vestibulocochlear nerve which emerges from the brainstem at the cerebellopontine angle to enter the internal acoustic meatus of the temporal bone. Within the distal aspect of the internal acoustic meatus, the vestibulocochlear nerve splits, forming the vestibular nerve innervating the vestibular system and the cochlear nerve innervating the cochlear.



Assessment

Hearing should be assessed grossly by whispering numbers and asking the patient to repeat it and by performing Rinne and Weber tests which aim to differentiate between conductive and sensorineural hearing loss. N.B. (AC = air conduction, BC = bone conduction)

Hearing Tests	Weber's test	Rinne's test
Screening test	Tests for and distinguishes between conductive and sensorineural deafness in unilateral hearing loss. 512 Hz tuning fork is placed in the middle of the forehead. The patient is asked to report in which ear the sound is heard loudest.	Assesses for the presence of conductive hearing loss in each ear. 512 Hz tuning fork is placed initially on the mastoid process behind each ear until sound is no longer heard (BC), and then placed immediately just outside the ear (AC) with the patient asked to report when the sound is no longer heard.
Normal hearing	Normally sound is heard equally in both ears.	Normally, AC time is longer and louder than BC (AC > BC, Rinne positive).
Unilateral conductive deafness	Sound lateralises to the affected ear.	In the affected ear BC > AC (Rinne negative).
Unilateral sensorineural deafness	Sound lateralises to the normal ear.	In the affected ear AC > BC (Rinne positive).

Clinical implications

Damage to the vestibulocochlear nerve results in (ipsilateral):

- Sensorineural deafness
- Tinnitus
- Loss of equilibrium
- Nystagmus
- Vertigo

Possible causes of damage to the vestibulocochlear nerve include:

- Infections e.g. vestibular neuritis, mastoiditis and herpes zoster
- Cerebellopontine angle tumours (85% are acoustic neuromas, others include meningiomas, cholesteatomas and primary malignancies of the posterior fossa)
- Tumours invading the temporal bone e.g. brainstem glioma
- Vascular malformations at the cerebellopontine angle
- Drugs e.g. aspirin, furosemide, phenytoin, cytotoxics, alcohol
- Paget's disease
- Fracture of the petrous temporal bone
- Basal skull fracture

Question Navigator

24	Answered
25	Answered
26	Current Question
27	...
28	...
29	...
30	...
31	...
32	...
33	...
34	...
35	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 27 of 142

Which of the following is NOT a typical cause of a bitemporal hemianopia:



- ☐ a Pituitary adenoma
- ☐ b Craniopharyngioma
- ☐ c Optic glioma
- ☐ d Posterior cerebral artery stroke
- ☐ e Aneurysm of the anterior communicating artery

< Previous

Next >

See Answer

Something wrong?

Question Navigator

24 Answered

25 Answered

26 Answered

27 Current Question

28 ...

29 ...

30 ...

31 ...

32 ...

33 ...

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 27 of 142



Which of the following is NOT a typical cause of a bitemporal hemianopia:

- a) Pituitary adenoma
- b) Craniopharyngioma
- c) Optic glioma
- d) **Posterior cerebral artery stroke** ✓
- e) Aneurysm of the anterior communicating artery

Answer

A bitemporal hemianopia is most likely due to compression at the optic chiasm. This may be caused by pituitary tumour, craniopharyngioma, meningioma, optic glioma or aneurysm of the internal carotid artery. A posterior cerebral stroke will most likely result in a contralateral homonymous hemianopia with macular sparing.

Notes

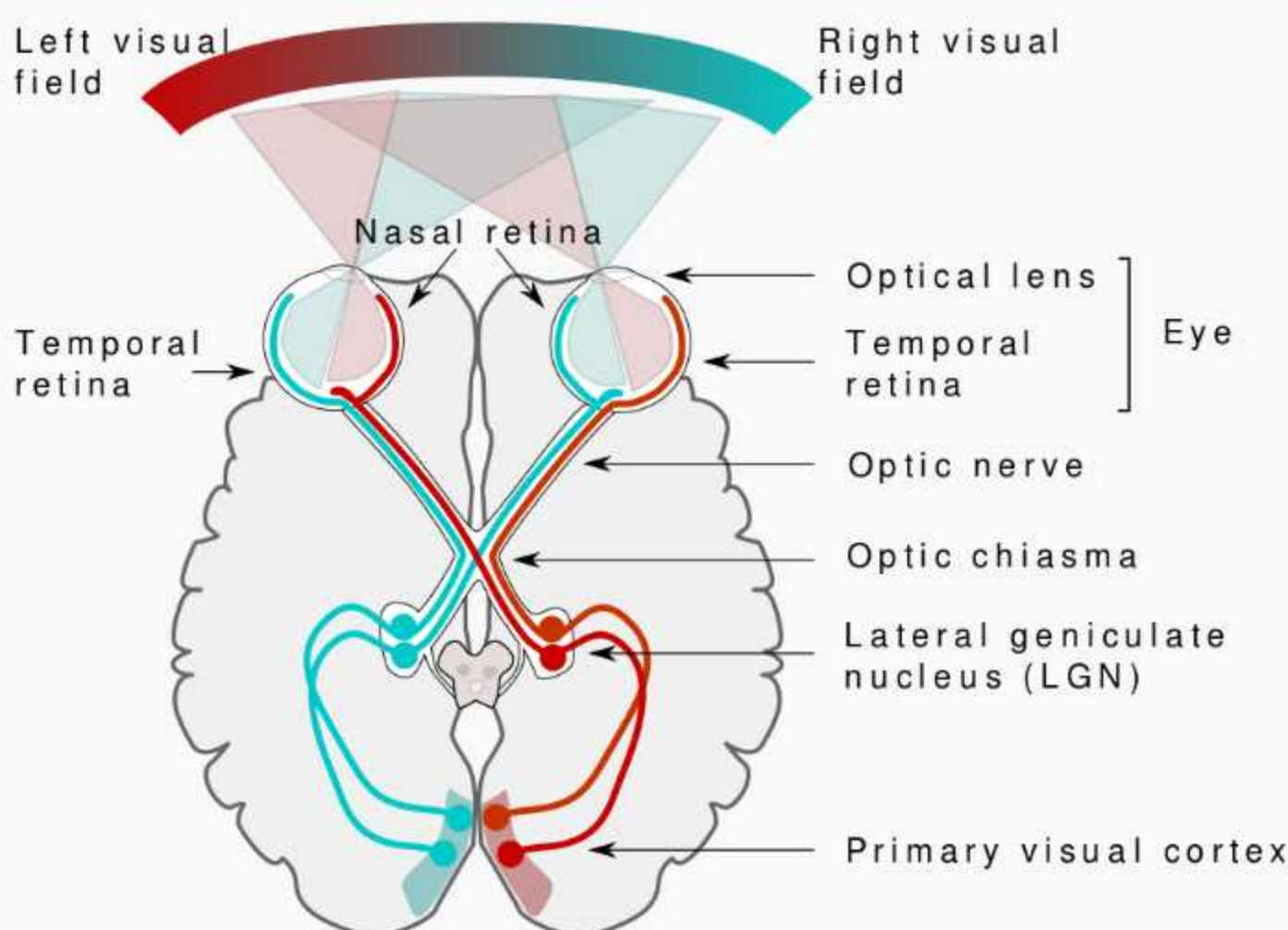
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (<http://creativecommons.org/licenses/by-sa/4.0/>)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

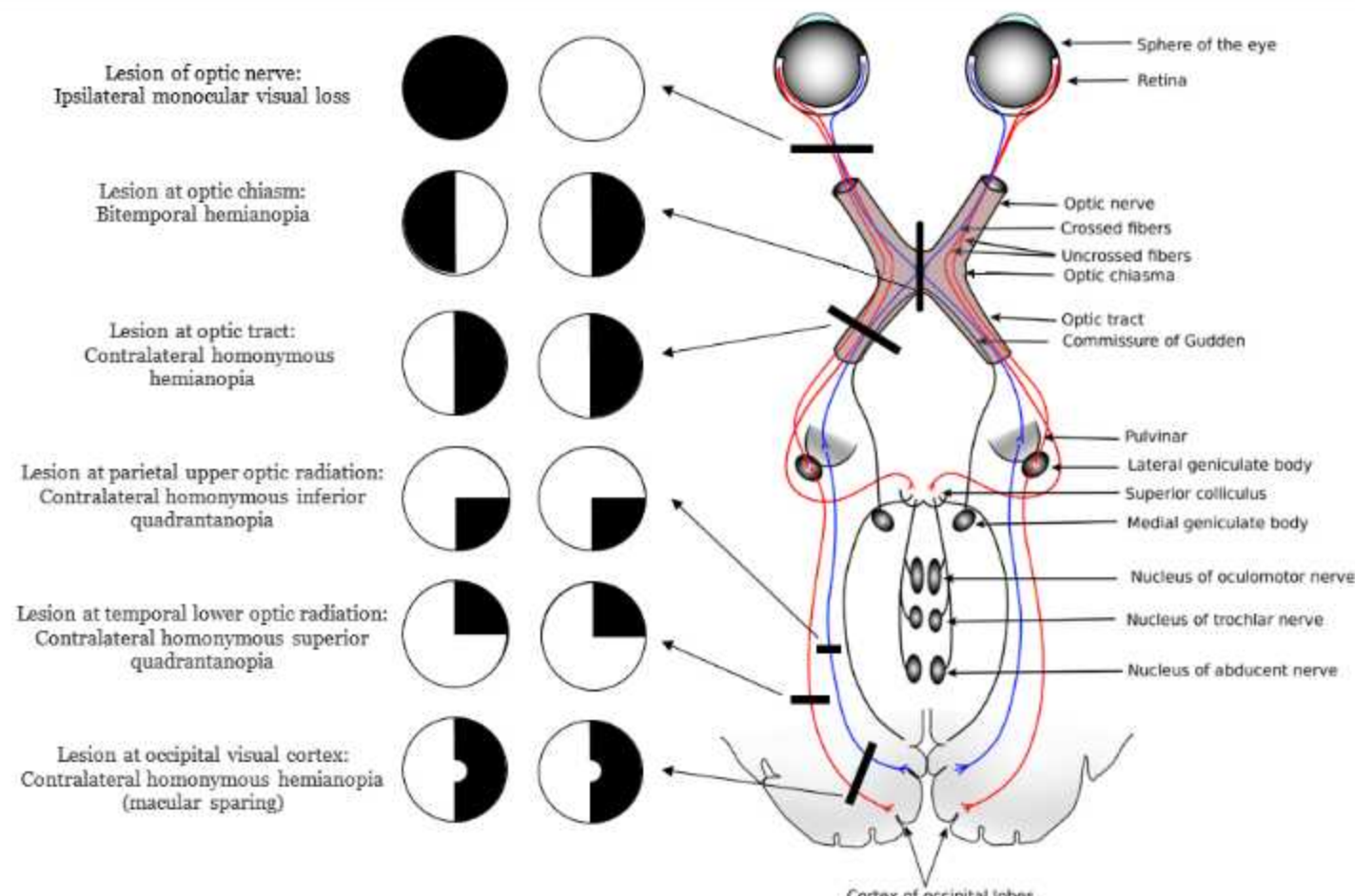
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 28 of 142



Regarding cerebrospinal fluid, which of the following statements is NOT correct:

- ☐ a The total volume of CSF is around 130 mL.
- ☐ b The bulk of CSF formation occurs in the lateral ventricles.
- ☐ c The inferior horn of the lateral ventricle projects into the temporal lobe.
- ☐ d The lateral ventricles are connected to the third ventricle by the cerebral aqueduct.
- ☐ e The fourth ventricle lies within the brainstem.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

24 Answered

25 Answered

26 Answered

27 Answered

28 Current Question

29 ...

30 ...

31 ...

32 ...

33 ...

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 28 of 142

Regarding cerebrospinal fluid, which of the following statements is NOT correct:

- a) The total volume of CSF is around 130 mL.
- b) The bulk of CSF formation occurs in the lateral ventricles.
- c) The inferior horn of the lateral ventricle projects into the temporal lobe.
- d) The lateral ventricles are connected to the third ventricle by the cerebral aqueduct. ✓
- e) The fourth ventricle lies within the brainstem.

Answer

The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

Notes

The ventricles are a set of communicating cavities within the brain that are responsible for the production, transport and removal of cerebrospinal fluid (CSF), which bathes the central nervous system. Total CSF volume is about 130 ml, of which the majority is in the subarachnoid space.

CSF functions

CSF has three main functions:

- 1) Protection – acting as a cushion for the brain
- 2) Buoyancy – reducing the net weight of the brain to prevent excessive pressure on the base of the brain
- 3) Chemical stability – creating the right chemical environment to allow proper functioning of the brain

CSF production

CSF is secreted by the ventricular choroid plexuses, which are vascular conglomerates of capillaries, pial and ependymal cells. The bulk of CSF arises from the plexuses of the lateral ventricles.

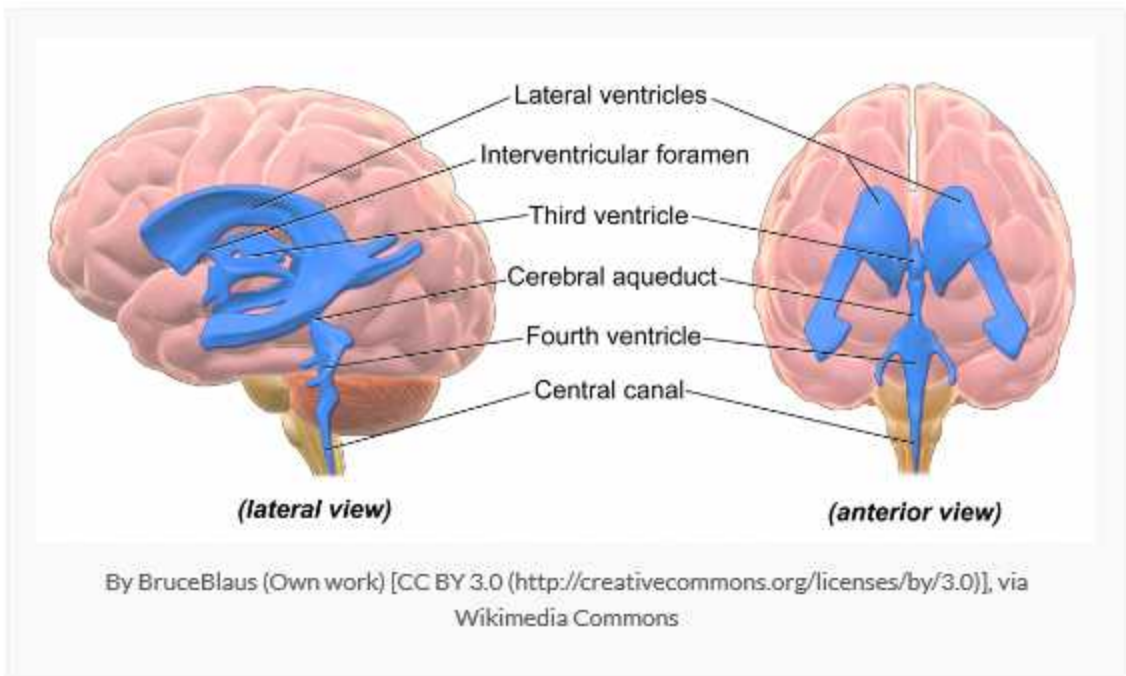
CSF transport in the ventricles

In total there are four ventricles; right and left lateral ventricles, the third ventricle and the fourth ventricle. In cross sectional radiology, the midline cavities (third and fourth ventricles and the aqueduct) are symmetrical, but the lateral ventricles (the cavities of the hemispheres) are not.

The lateral ventricles are C-shaped cavities located within their respective hemispheres of the cerebrum. They are divided into a body, an anterior horn (projecting into the frontal lobe), an inferior horn (projecting into the temporal lobe) and a posterior horn (projecting into the occipital lobe). The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

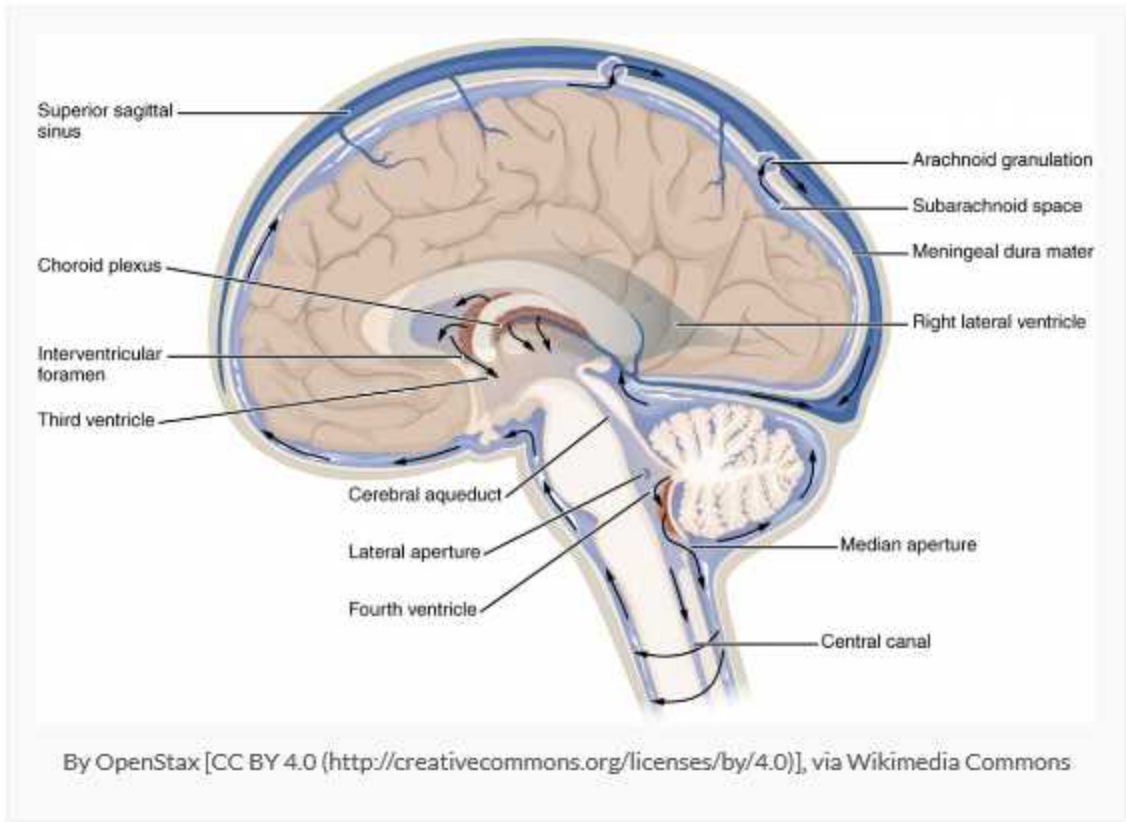
The third ventricle is a slit-like space in the sagittal plane, situated between the right and left thalamus and superior to the hypothalamus. The third ventricle is connected to the fourth ventricle by the cerebral aqueduct.

The fourth ventricle lies within the brainstem, at the junction between the pons and the medulla oblongata.



CSF removal

From the fourth ventricle, the CSF drains into the central spinal canal (bathing the spinal cord) and the subarachnoid cisterns in the subarachnoid space located between the arachnoid mater and pia mater (bathing the brain). From the subarachnoid cisterns, CSF is reabsorbed via arachnoid granulations which protrude into the dura mater, into the dural venous sinuses and from here back into the circulation.



There is small but significant CSF drainage via the cribriform plate of the ethmoid into the nasal tissues. Fracture of the cribriform plate results in CSF rhinorrhoea.

Question Navigator

24	Answered
25	Answered
26	Answered
27	Answered
28	Current Question
29	...
30	...
31	...
32	...
33	...
34	...
35	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 29 of 142



The internal capsule primarily contains which types of white matter fibres:

- ☐ a Projection fibres
- ☐ b Short association fibres
- ☐ c Commissural fibres
- ☐ d Long association fibres
- ☐ e U-fibres

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 24 Answered
- 25 Answered
- 26 Answered
- 27 Answered
- 28 Answered
- 29 Current Question
- 30 ...
- 31 ...
- 32 ...
- 33 ...
- 34 ...
- 35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 29 of 142



The internal capsule primarily contains which types of white matter fibres:

- a) Projection fibres 
- b) Short association fibres
- c) **Commissural fibres** 
- d) Long association fibres
- e) U-fibres

Answer

The internal capsule is a deep subcortical structure that contains a concentration of white matter projection fibres. Projection fibres connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebral cortex

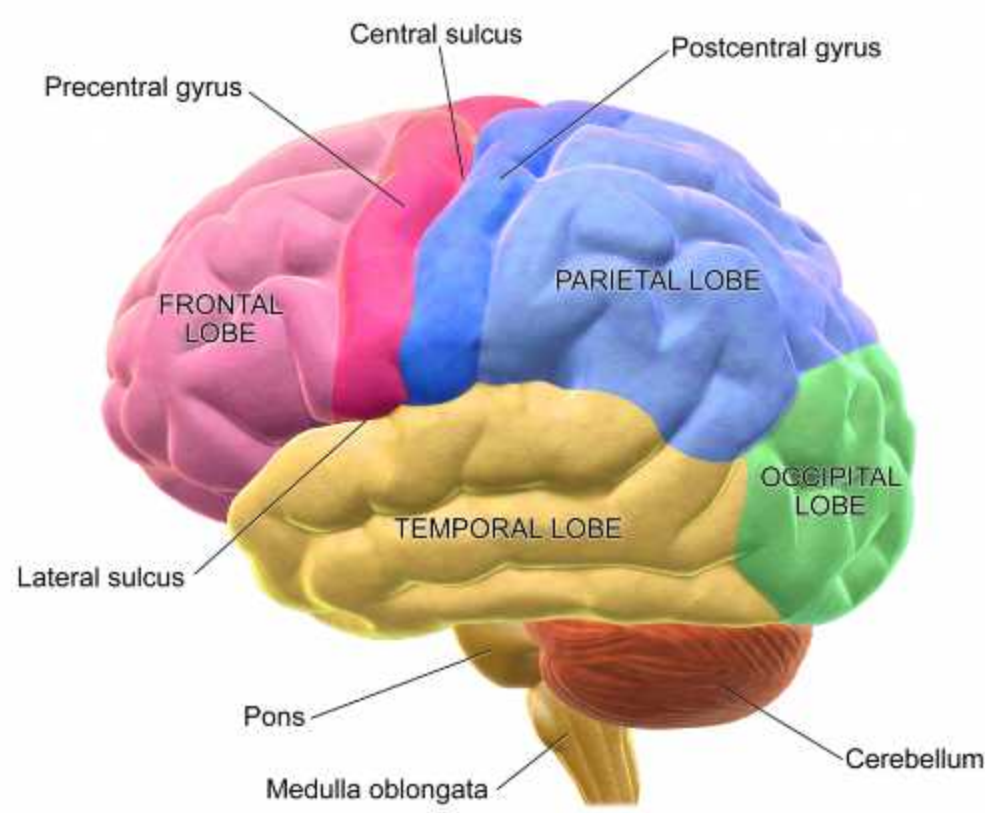
The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus

Lateral View of the Brain



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

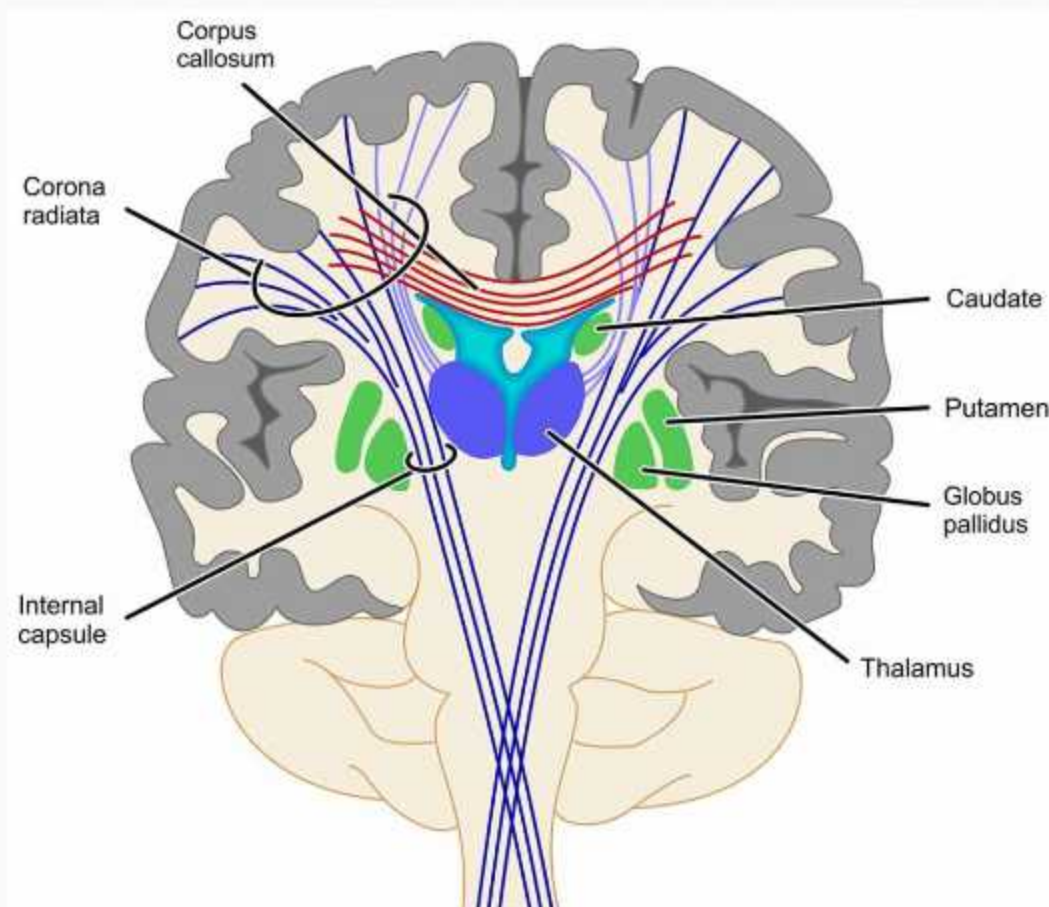
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 30 of 142

Which of the following is NOT a branch of the facial nerve:

- ☐ a Posterior auricular nerve
- ☐ b Chorda tympani
- ☐ c Marginal mandibular branch
- ☐ d Nerve to the stapedius
- ☐ e Mental nerve

< Previous

Next >

See Answer

Something wrong?



Question Navigator

- 24 Answered
- 25 Answered
- 26 Answered
- 27 Answered
- 28 Answered
- 29 Answered
- 30 Current Question
- 31 ...
- 32 ...
- 33 ...
- 34 ...
- 35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 30 of 142

Which of the following is NOT a branch of the facial nerve:

- a) Posterior auricular nerve
- b) Chorda tympani
- c) Marginal mandibular branch
- d) Nerve to the stapedius
- e) Mental nerve

Answer

The mental nerve is a branch of the mandibular division of the trigeminal nerve.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

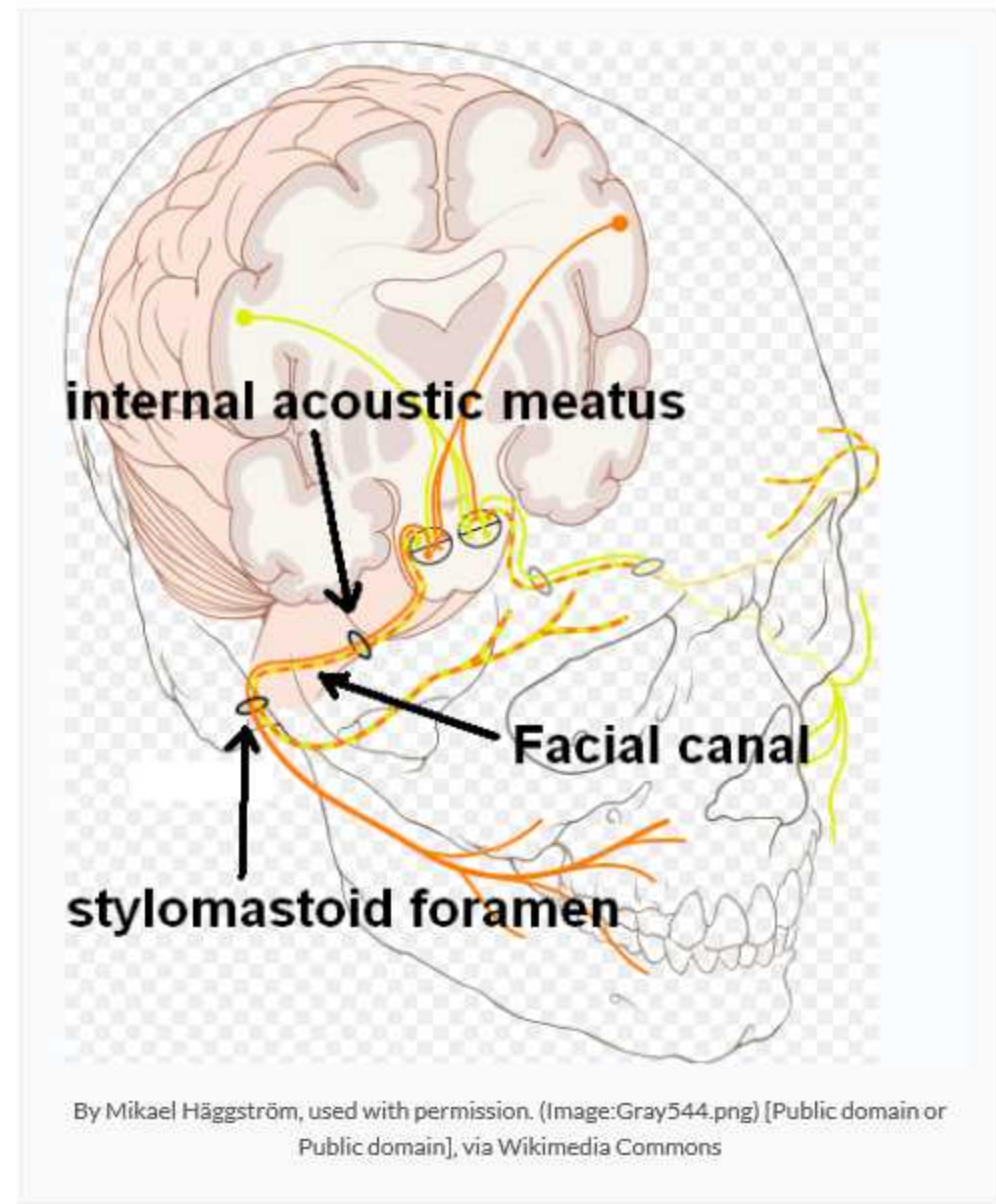
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

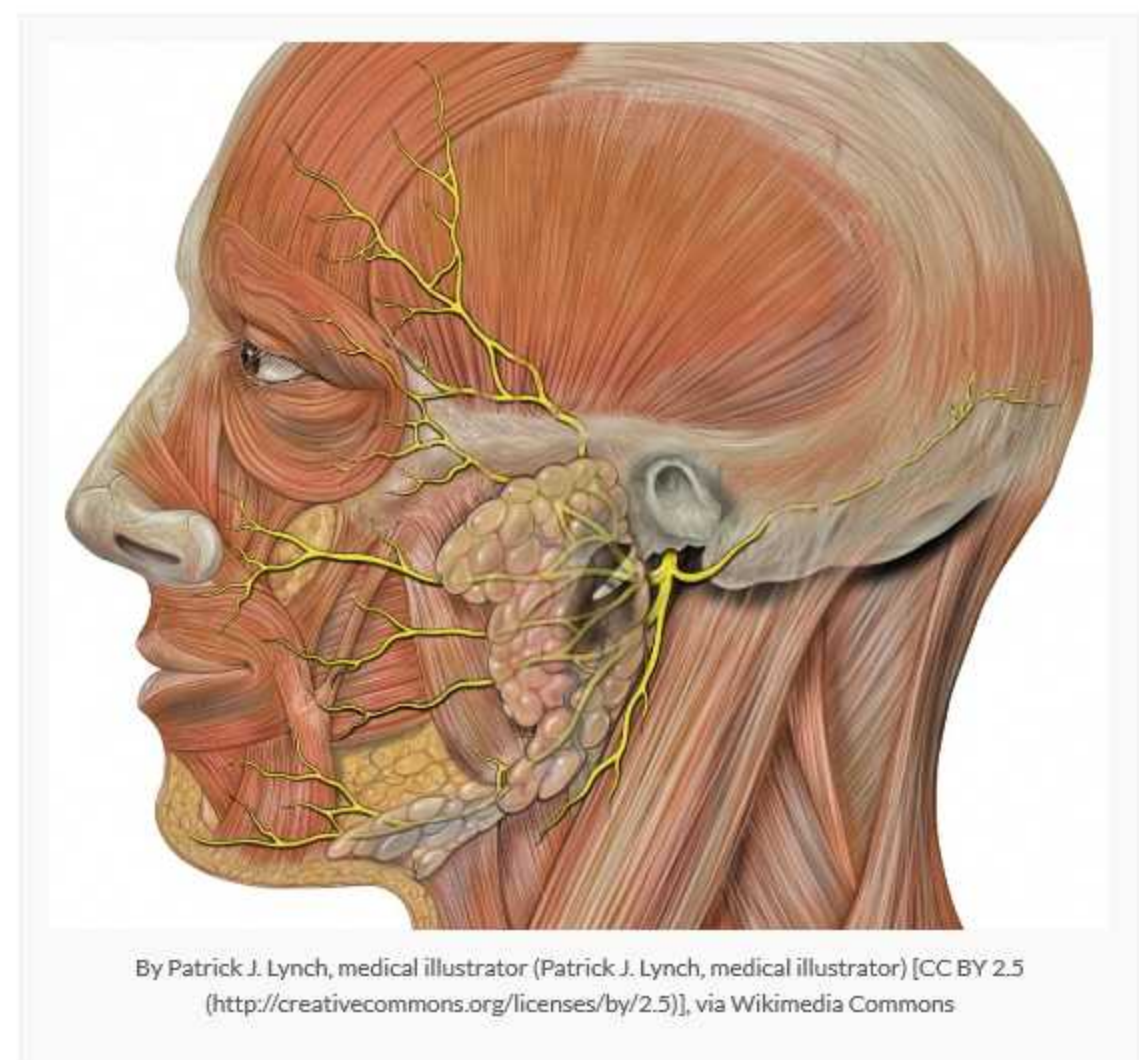
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

< Previous

Next >

Something wrong?

Question Navigator

24	Answered
25	Answered
26	Answered
27	Answered
28	Answered
29	Answered
30	Current Question
31	...
32	...
33	...
34	...
35	...
36	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 31 of 142



CSF is reabsorbed from subarachnoid space via which of the following structures:

- ☐ a Subarachnoid cisterns
- ☐ b Foramen of Monro
- ☐ c Cerebral aqueduct
- ☐ d Arachnoid granulations
- ☐ e Choroid plexus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

24 Answered

25 Answered

26 Answered

27 Answered

28 Answered

29 Answered

30 Answered

31 Current Question

32 ...

33 ...

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 31 of 142

CSF is reabsorbed from subarachnoid space via which of the following structures:

- a) Subarachnoid cisterns
- b) Foramen of Monro
- c) Cerebral aqueduct
- d) Arachnoid granulations
- e) Choroid plexus

Answer

From the subarachnoid cisterns in the subarachnoid space, CSF is reabsorbed via arachnoid granulations which protrude into the dura mater, into the dural venous sinuses and from here back into the circulation.

Notes

The ventricles are a set of communicating cavities within the brain that are responsible for the production, transport and removal of cerebrospinal fluid (CSF), which bathes the central nervous system. Total CSF volume is about 130 ml, of which the majority is in the subarachnoid space.

CSF functions

CSF has three main functions:

- 1) Protection – acting as a cushion for the brain
- 2) Buoyancy – reducing the net weight of the brain to prevent excessive pressure on the base of the brain
- 3) Chemical stability – creating the right chemical environment to allow proper functioning of the brain

CSF production

CSF is secreted by the ventricular choroid plexuses, which are vascular conglomerates of capillaries, pial and ependymal cells. The bulk of CSF arises from the plexuses of the lateral ventricles.

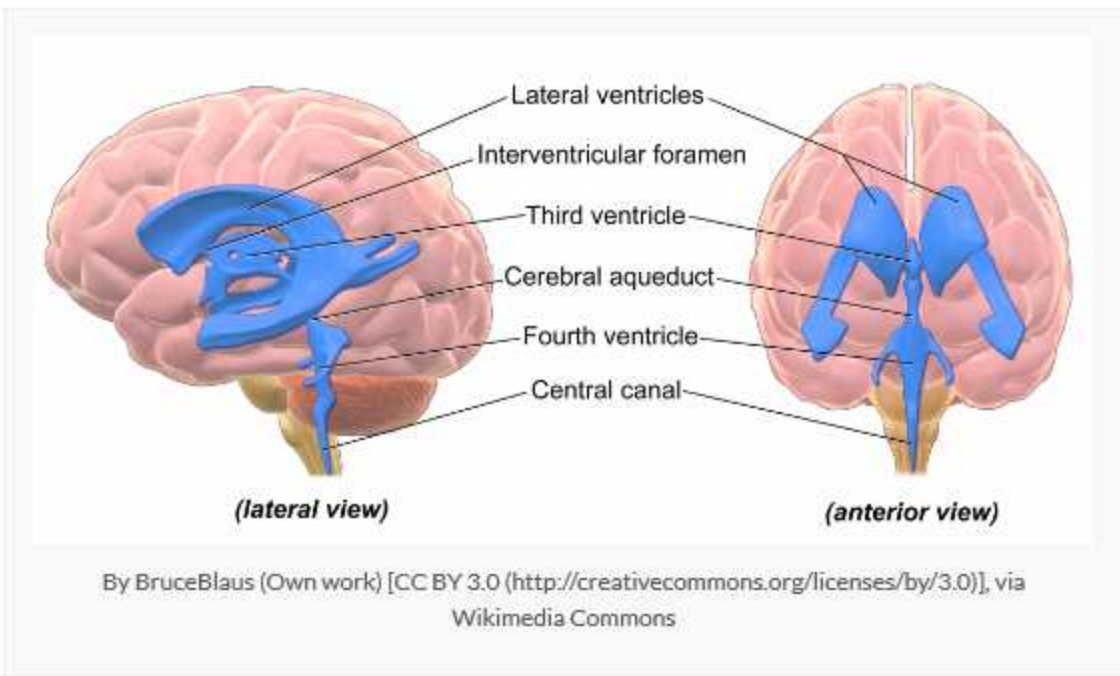
CSF transport in the ventricles

In total there are four ventricles; right and left lateral ventricles, the third ventricle and the fourth ventricle. In cross sectional radiology, the midline cavities (third and fourth ventricles and the aqueduct) are symmetrical, but the lateral ventricles (the cavities of the hemispheres) are not.

The lateral ventricles are C-shaped cavities located within their respective hemispheres of the cerebrum. They are divided into a body, an anterior horn (projecting into the frontal lobe), an inferior horn (projecting into the temporal lobe) and a posterior horn (projecting into the occipital lobe). The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

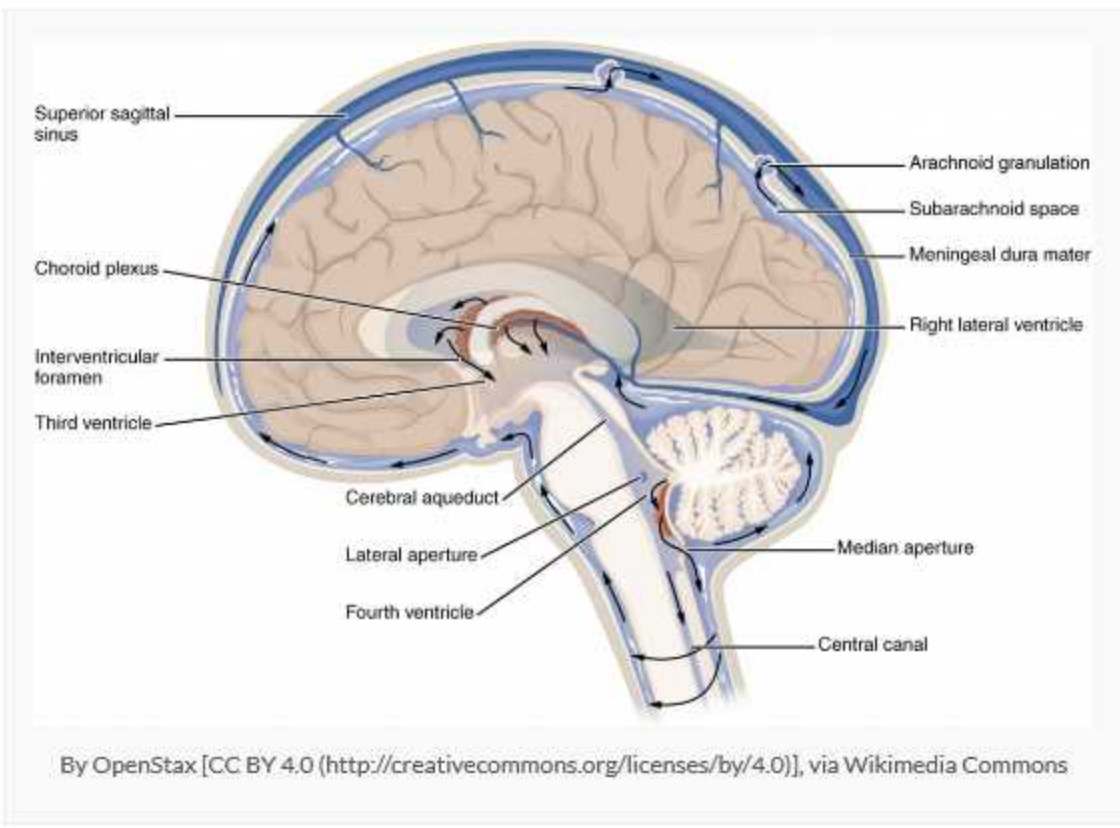
The third ventricle is a slit-like space in the sagittal plane, situated between the right and left thalamus and superior to the hypothalamus. The third ventricle is connected to the fourth ventricle by the cerebral aqueduct.

The fourth ventricle lies within the brainstem, at the junction between the pons and the medulla oblongata.



CSF removal

From the fourth ventricle, the CSF drains into the central spinal canal (bathing the spinal cord) and the subarachnoid cisterns in the subarachnoid space located between the arachnoid mater and pia mater (bathing the brain). From the subarachnoid cisterns, CSF is reabsorbed via arachnoid granulations which protrude into the dura mater, into the dural venous sinuses and from here back into the circulation.



There is small but significant CSF drainage via the cribriform plate of the ethmoid into the nasal tissues. Fracture of the cribriform plate results in CSF rhinorrhoea.

Question Navigator

24	Answered
25	Answered
26	Answered
27	Answered
28	Answered
29	Answered
30	Answered
31	Current Question
32	...
33	...
34	...
35	...
36	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 32 of 142



A 40 year old female presents to ED complaining of complete visual loss in her right eye. On fundoscopy you note a pale retina and a cherry red spot. You suspect an emboli. Which of the following blood vessels is most likely the source of the emboli:

- ☐ a Anterior cerebral artery
- ☐ b Middle cerebral artery
- ☐ c Posterior cerebral artery
- ☒ d Internal carotid artery
- ☐ e External carotid artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

24 Answered

25 Answered

26 Answered

27 Answered

28 Answered

29 Answered

30 Answered

31 Answered

32 Current Question

33 ...

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 32 of 142



A 40 year old female presents to ED complaining of complete visual loss in her right eye. On fundoscopy you note a pale retina and a cherry red spot. You suspect an emboli. Which of the following blood vessels is most likely the source of the emboli:

- a) Anterior cerebral artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Internal carotid artery
- e) External carotid artery

Answer

The internal carotid artery is the most likely source of the emboli. The ophthalmic artery arises from the internal carotid artery and supplies structures in the orbit and eyeball. The central retinal artery is the most important branch of the ophthalmic artery, supplying the retina and the optic disc. The central retinal artery is an end artery that does not anastomose with other arteries, and thus its occlusion results in monocular blindness.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

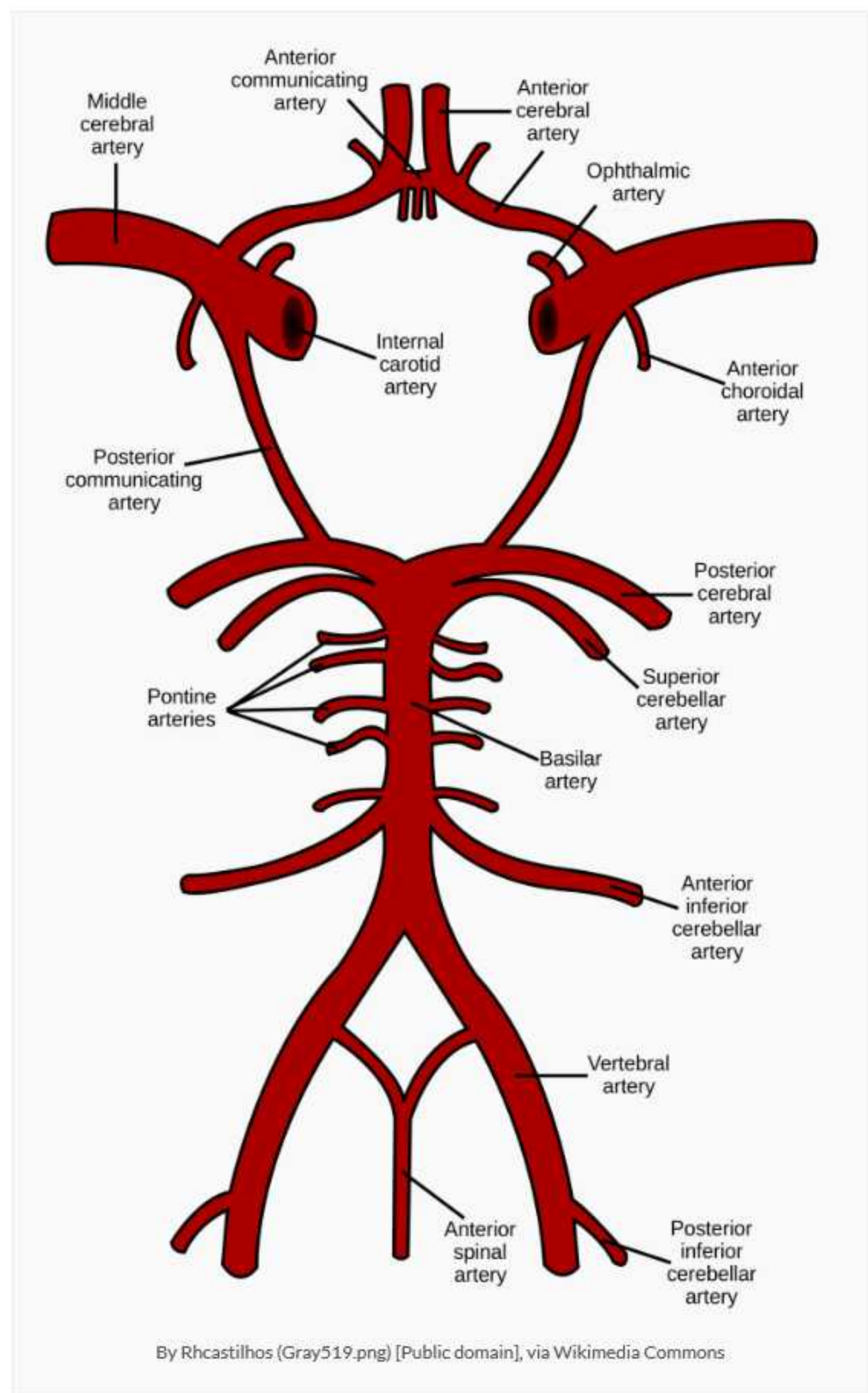
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebral artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

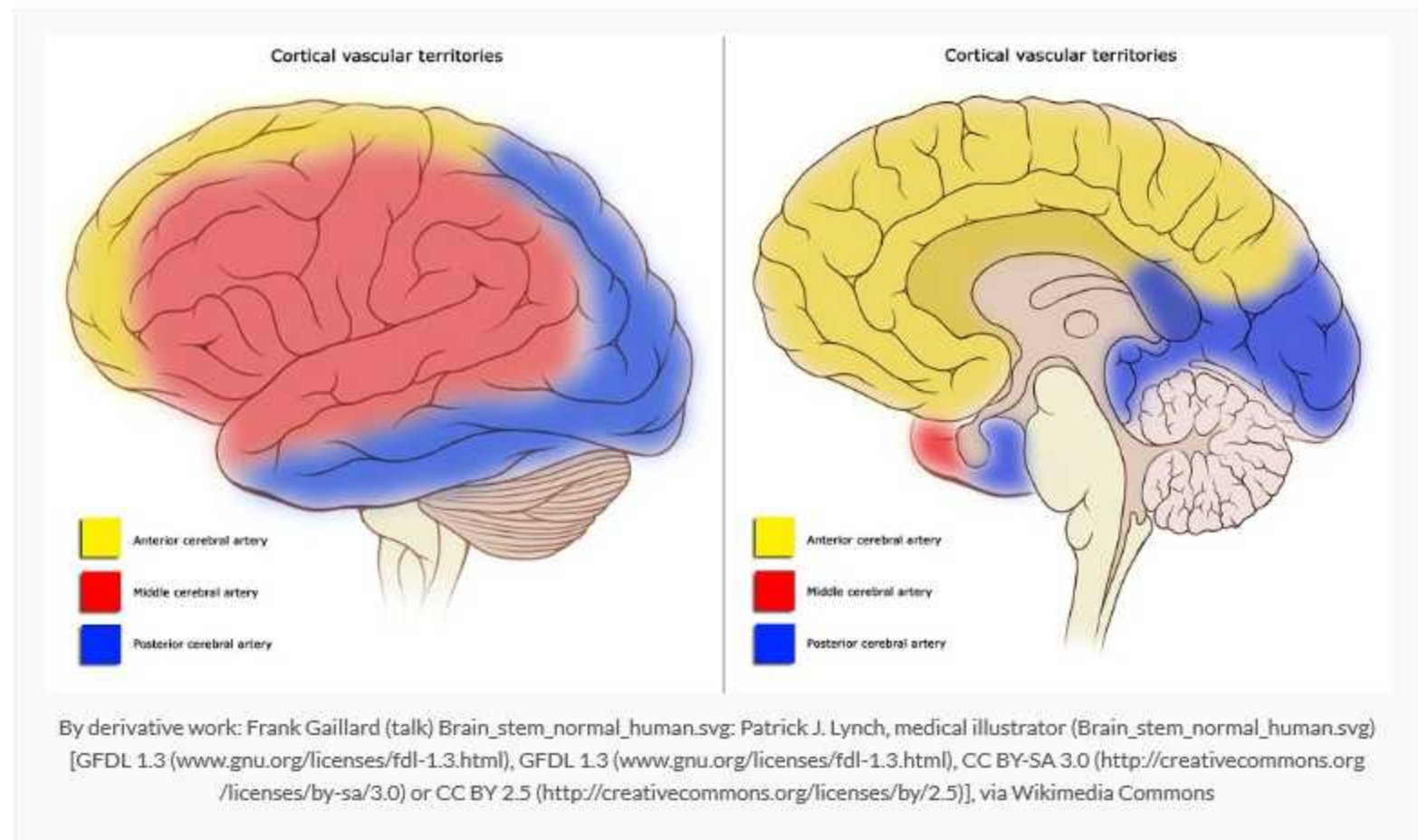
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change• PARIETAL LOBE: contralateral somatosensory loss in the lower limb• CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood• TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia• PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia• N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none">• OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral)• TEMPORAL LOBE: confusion, memory deficit• OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



Question Navigator	
24	Answered
25	Answered
26	Answered
27	Answered
28	Answered
29	Answered
30	Answered
31	Answered
32	Current Question
33	...
34	...
35	...

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 33 of 142



The trochlear nerve innervates which of the following muscles:

- ☐ a Inferior oblique
- ☐ b Superior oblique
- ☐ c Medial rectus
- ☐ d Lateral rectus
- ☐ e Superior rectus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

24 Answered

25 Answered

26 Answered

27 Answered

28 Answered

29 Answered

30 Answered

31 Answered

32 Answered

33 Current Question

34 ...

35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 33 of 142

The trochlear nerve innervates which of the following muscles:

- a) Inferior oblique
- b) Superior oblique
- c) Medial rectus
- d) Lateral rectus
- e) Superior rectus

Answer

The trochlear nerve innervates the superior oblique muscle of the eye.

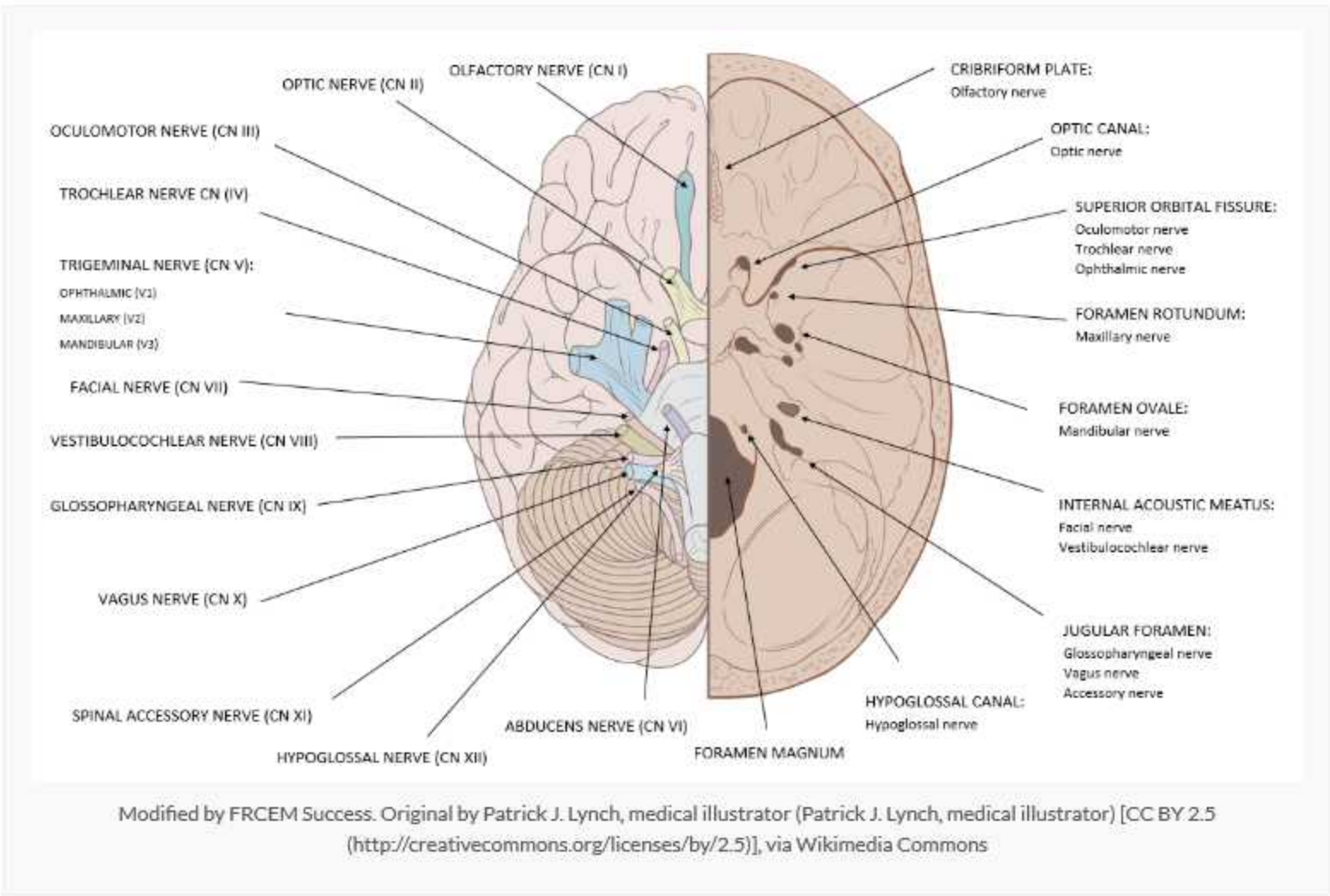
Notes

The trochlear nerve (CN IV) is a motor nerve supplying the superior oblique muscle of the eye.

Cranial nerve	Trochlear nerve (CN IV)
Key anatomy	Arises from midbrain, travels through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: superior oblique muscle of eye (intorsion, depression and abduction of eye)
Assessment	Eye movements
Clinical effects of injury	Weakness of downward gaze (difficulty reading/walking downstairs), vertical diplopia, eye is extorted and may be elevated (patient head tilts to opposite side to compensate)
Causes of injury	Idiopathic, trauma, microvasculopathy, cavernous sinus disease, raised intracranial pressure

Anatomical course

It is the smallest cranial nerve but has the longest cranial course. It arises from the trochlear nucleus and decussates within the midbrain, emerging from the posterior aspect of the midbrain. It runs anteroinferiorly within the subarachnoid space before piercing the dura and travelling along the lateral wall of the cavernous sinus, before entering the orbit of the eye via the superior orbital fissure.



Function

The superior oblique primarily rotates the top of the eye towards the nose (intorsion). Secondly, it moves the eye downward (depression) and outward (abduction). It prevents the unopposed action of the superior rectus which would otherwise rotate the globe.

Clinical implications

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

Causes of damage include:

- Idiopathic (most commonly)
- Trauma
- Microvasculopathy (associated with diabetes and hypertension)
- Multiple sclerosis
- Lesions in the midbrain
- Cavernous sinus disease
- Raised intracranial pressure

Question Navigator

24	Answered
25	Answered
26	Answered
27	Answered
28	Answered
29	Answered
30	Answered
31	Answered
32	Answered
33	Current Question
34	...
35	...
36	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 34 of 142



Regarding the mandibular nerve, which of the following statements is **INCORRECT**:

- ☐ a The mandibular nerve enters the infratemporal fossa between the tensor veli palatini muscle and the lateral pterygoid muscle.
- ☐ b The mandibular nerve exits the cranium through the foramen ovale.
- ☐ c The mandibular nerve supplies sensation to the anterior two-thirds of the tongue.
- ☒ d The mandibular nerve innervates the orbicularis oculi.
- ☐ e The mandibular nerve has both motor and sensory function.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 24 Answered
- 25 Answered
- 26 Answered
- 27 Answered
- 28 Answered
- 29 Answered
- 30 Answered
- 31 Answered
- 32 Answered
- 33 Answered
- 34 Current Question
- 35 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 34 of 142

Regarding the mandibular nerve, which of the following statements is INCORRECT:

- a) The mandibular nerve enters the infratemporal fossa between the tensor veli palatini muscle and the lateral pterygoid muscle.
- b) The mandibular nerve exits the cranium through the foramen ovale.
- c) The mandibular nerve supplies sensation to the anterior two-thirds of the tongue.
- d) The mandibular nerve innervates the orbicularis oculi.
- e) The mandibular nerve has both motor and sensory function.

Answer

The orbicularis oculi, as a muscle of facial expression, is innervated by the facial nerve.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

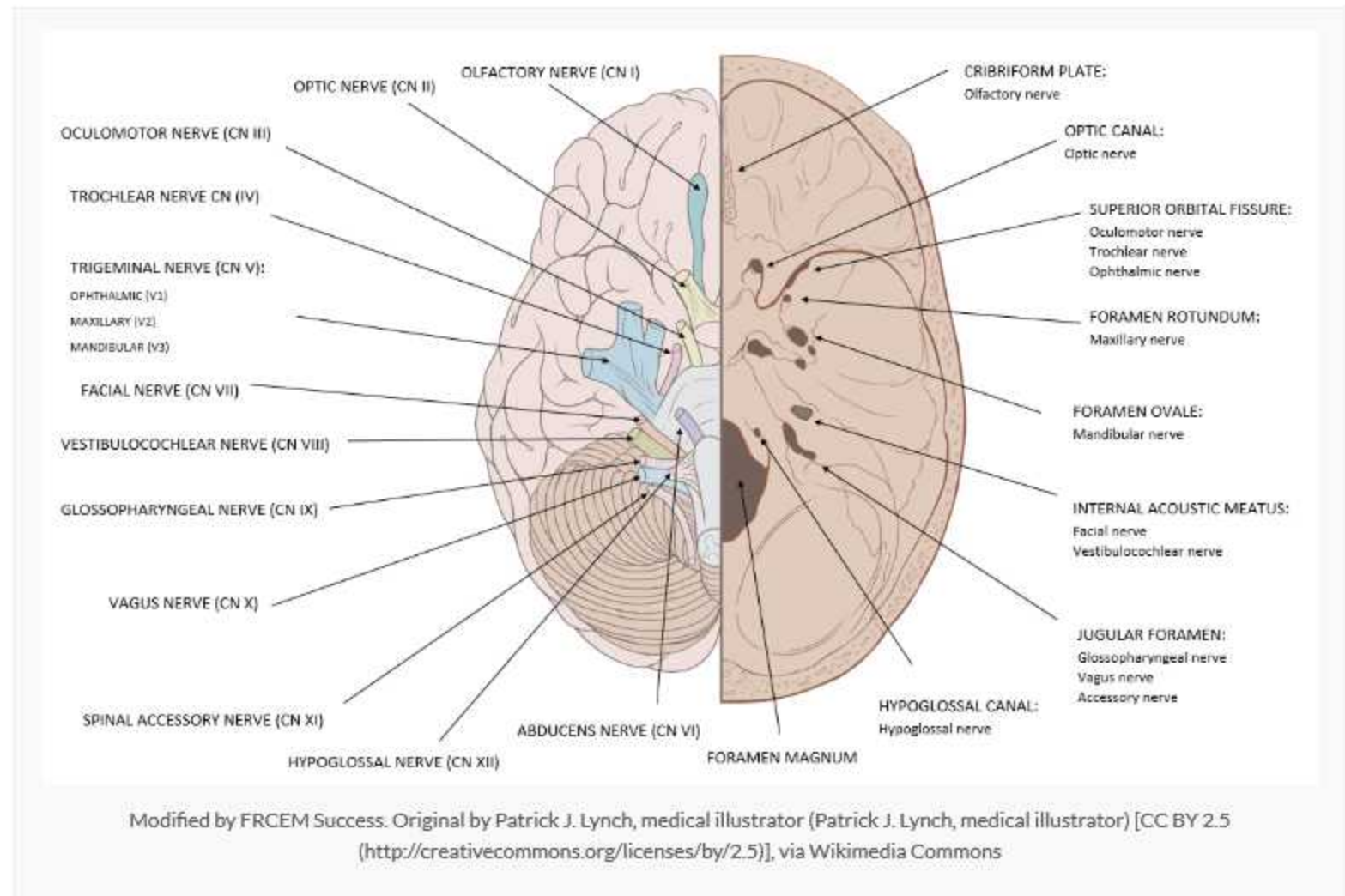
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory – innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

< Previous

Next >

Something wrong?

Question Navigator

24	Answered
25	Answered
26	Answered
27	Answered
28	Answered
29	Answered
30	Answered
31	Answered
32	Answered
33	Answered
34	Current Question
35	--
36	--

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 35 of 142



The mandibular division of the trigeminal nerve exits the skull through the:

- ☐ a Foramen rotundum
- ☐ b Foramen ovale
- ☐ c Hypoglossal canal
- ☐ d Internal acoustic meatus
- ☐ e Jugular foramen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 24 Answered
- 25 Answered
- 26 Answered
- 27 Answered
- 28 Answered
- 29 Answered
- 30 Answered
- 31 Answered
- 32 Answered
- 33 Answered
- 34 Answered
- 35 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 35 of 142

The mandibular division of the trigeminal nerve exits the skull through the:

- a) Foramen rotundum
- b) Foramen ovale
- c) Hypoglossal canal
- d) Internal acoustic meatus
- e) Jugular foramen

Answer

The mandibular nerve exits the skull through the foramen ovale.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

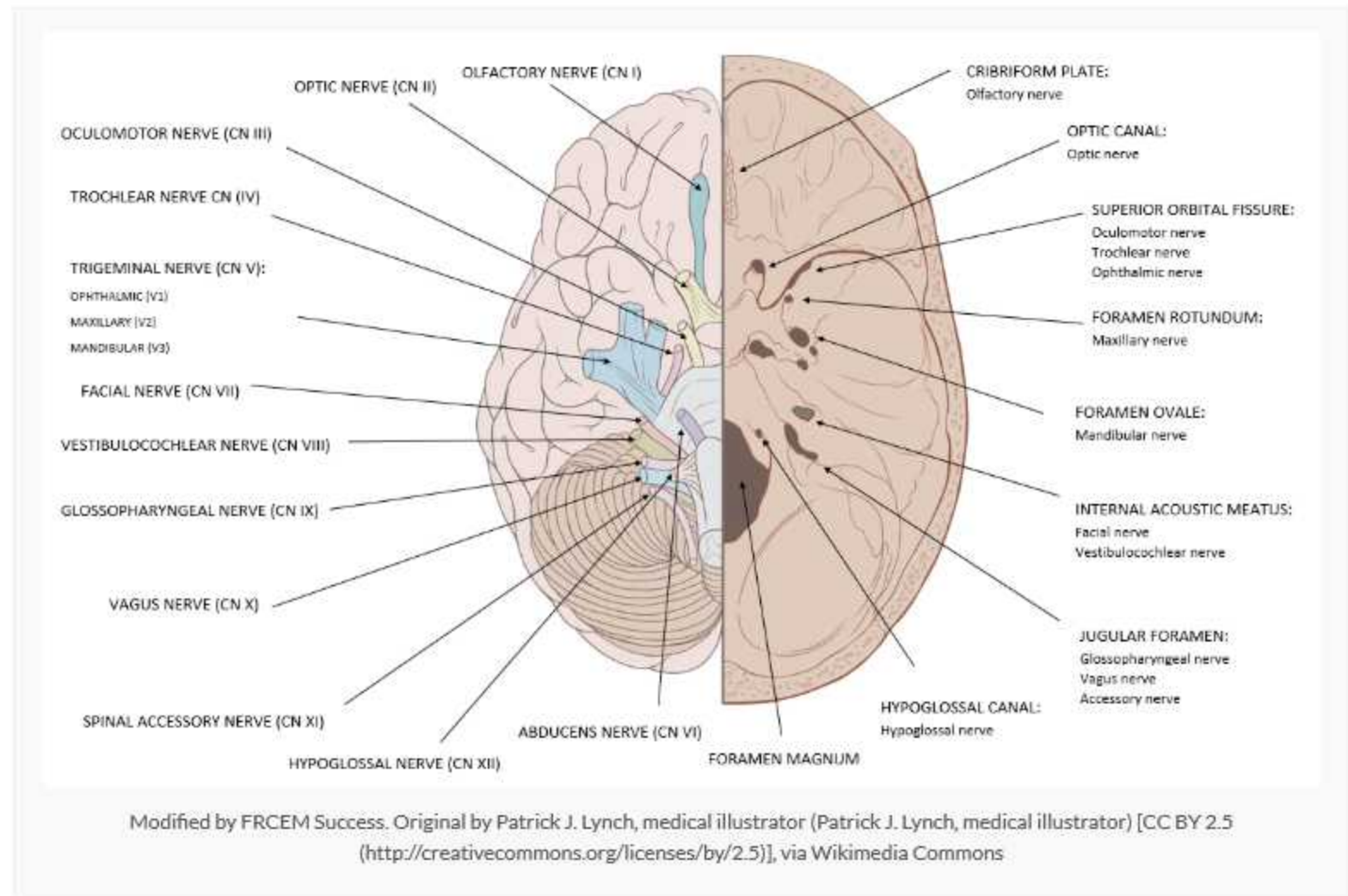
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory – innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

< Previous

Next >

Something wrong?

Question Navigator

- 24 Answered
- 25 Answered
- 26 Answered
- 27 Answered
- 28 Answered
- 29 Answered
- 30 Answered
- 31 Answered
- 32 Answered
- 33 Answered
- 34 Answered
- 35 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 36 of 142

Which of the following best describes the position of the occipital lobe:



- ☐ a Anterior to the parieto-occipital sulcus
- ☐ b Posterior to the central sulcus and inferior to the lateral sulcus
- ☐ c Posterior to the central sulcus and superior to the lateral sulcus
- ☐ d Inferior to the lateral sulcus
- ☐ e Inferior to the parieto-occipital sulcus

< Previous

Next >

See Answer

Something wrong?

Question Navigator

24 Answered

25 Answered

26 Answered

27 Answered

28 Answered

29 Answered

30 Answered

31 Answered

32 Answered

33 Answered

34 Answered

35 Answered

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 36 of 142

Which of the following best describes the position of the occipital lobe:

- Anterior to the parieto-occipital sulcus
- Posterior to the central sulcus and inferior to the lateral sulcus
- Posterior to the central sulcus and superior to the lateral sulcus
- Inferior to the lateral sulcus
- Inferior to the parieto-occipital sulcus** ✓



Answer

The occipital lobe lies inferior to the parieto-occipital sulcus.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebral cortex

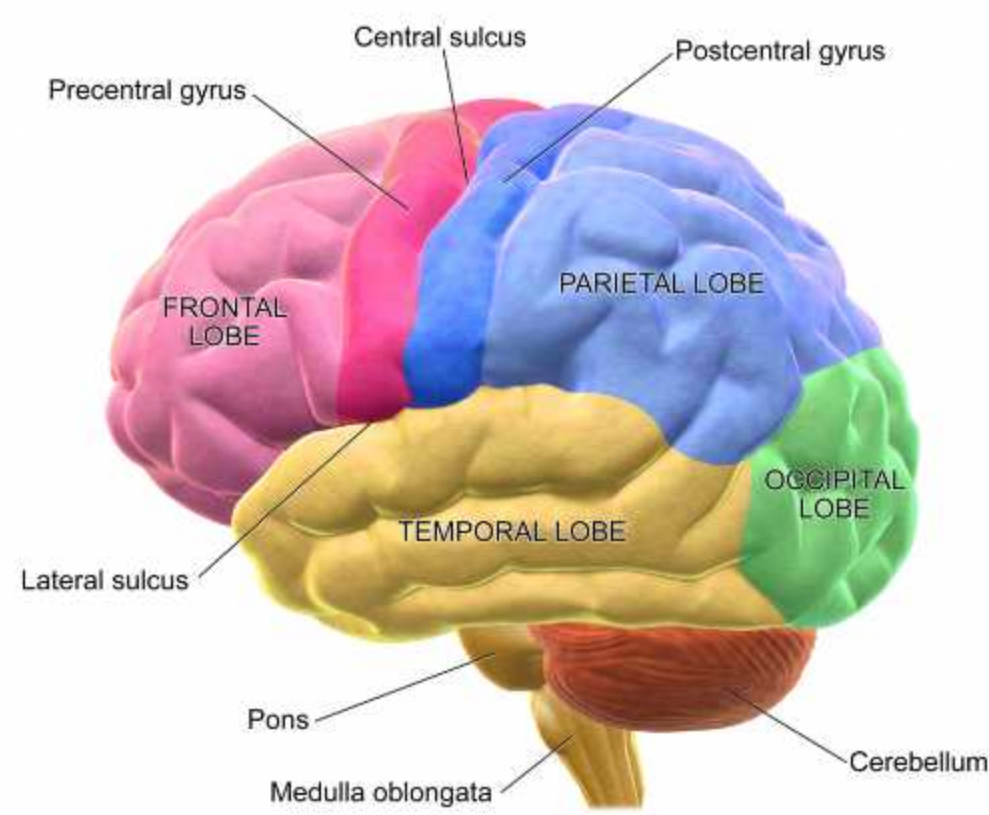
The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus

Lateral View of the Brain



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

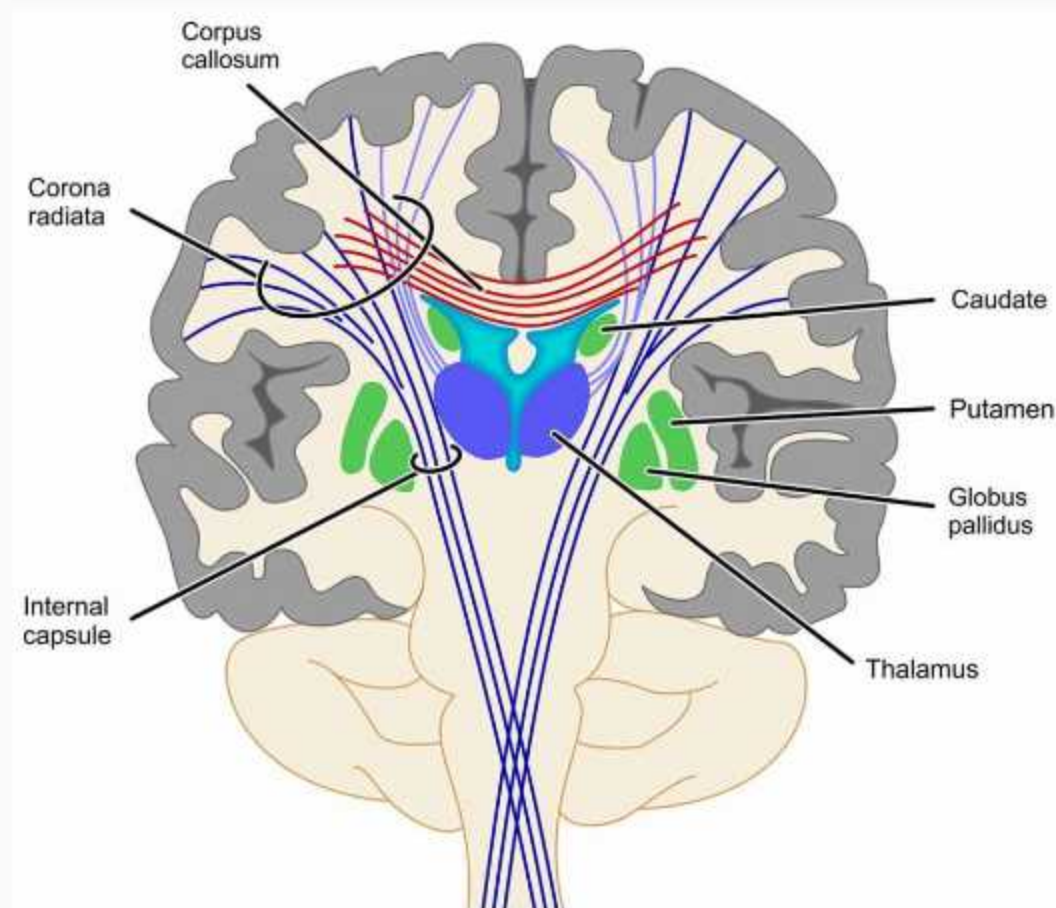
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk




[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 37 of 142



The blood supply to the frontal lobe is primarily supplied by which of the following arteries:

- ☐ a Anterior cerebral artery
- ☒ b Middle cerebral artery
- ☐ c Posterior cerebral artery
- ☐ d Anterior and middle cerebral artery
- ☐ e Basilar artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

37 Current Question

38 ...

39 ...

40 ...

41 ...

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 37 of 142



The blood supply to the frontal lobe is primarily supplied by which of the following arteries:

- a) Anterior cerebral artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Anterior and middle cerebral artery
- e) Basilar artery

Answer

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

Areas of the frontal lobe are responsible for:

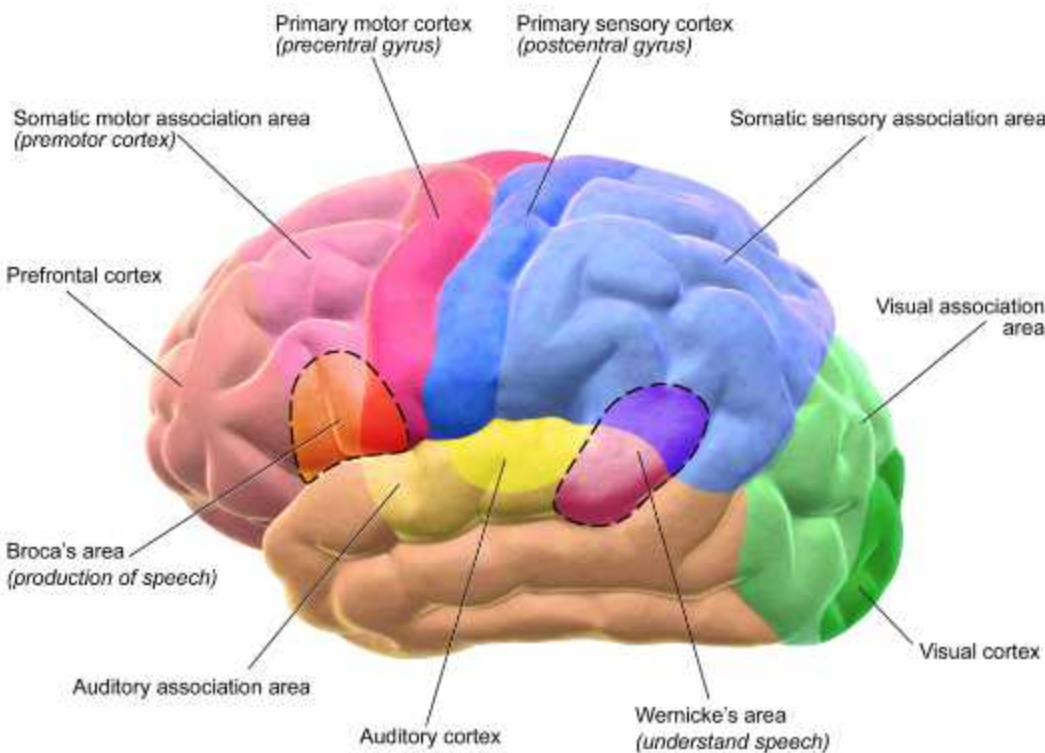
- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.

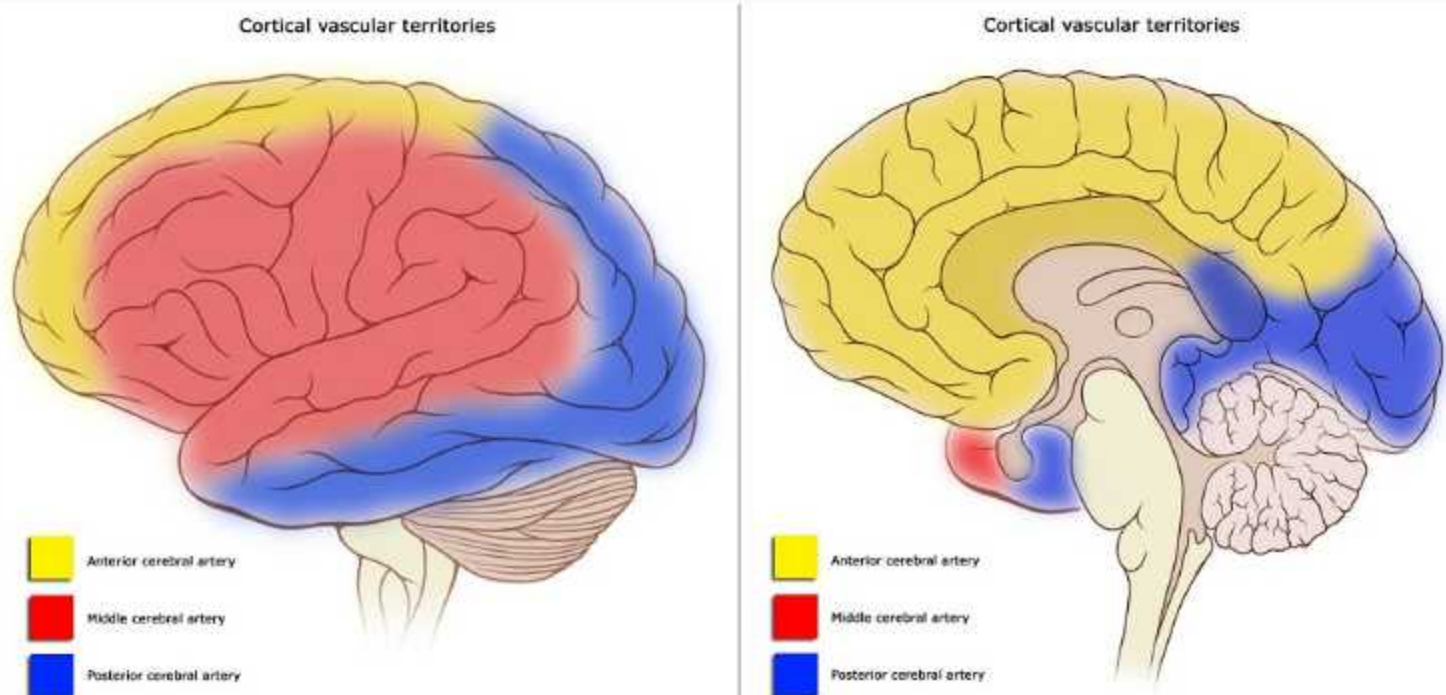
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

< Previous

Next >

Something wrong?

Question Navigator

37 Current Question

38 ...

39 ...

40 ...

41 ...

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get In Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 38 of 142



A 56 year old female presents to ED complaining of loss of sensation over the anterior two-thirds of her tongue. Taste and salivation are intact. Which of the following nerves is most likely affected:

- ☐ a Glossopharyngeal nerve
- ☐ b Lingual nerve
- ☐ c Chorda tympani nerve
- ☐ d Hypoglossal nerve
- ☐ e Inferior alveolar nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

37 Answered

38 Current Question

39 ...

40 ...

41 ...

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 38 of 142



A 56 year old female presents to ED complaining of loss of sensation over the anterior two-thirds of her tongue. Taste and salivation are intact. Which of the following nerves is most likely affected:

- a) Glossopharyngeal nerve
- b) Lingual nerve
- c) Chorda tympani nerve
- d) Hypoglossal nerve
- e) Inferior alveolar nerve

Answer

General sensation to the anterior two-thirds of the tongue is carried by the lingual nerve, branch of the mandibular nerve. Taste to the anterior two-thirds of the tongue (and secretomotor innervation to the submandibular and sublingual glands) is carried by the chorda tympani, branch of the facial nerve.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

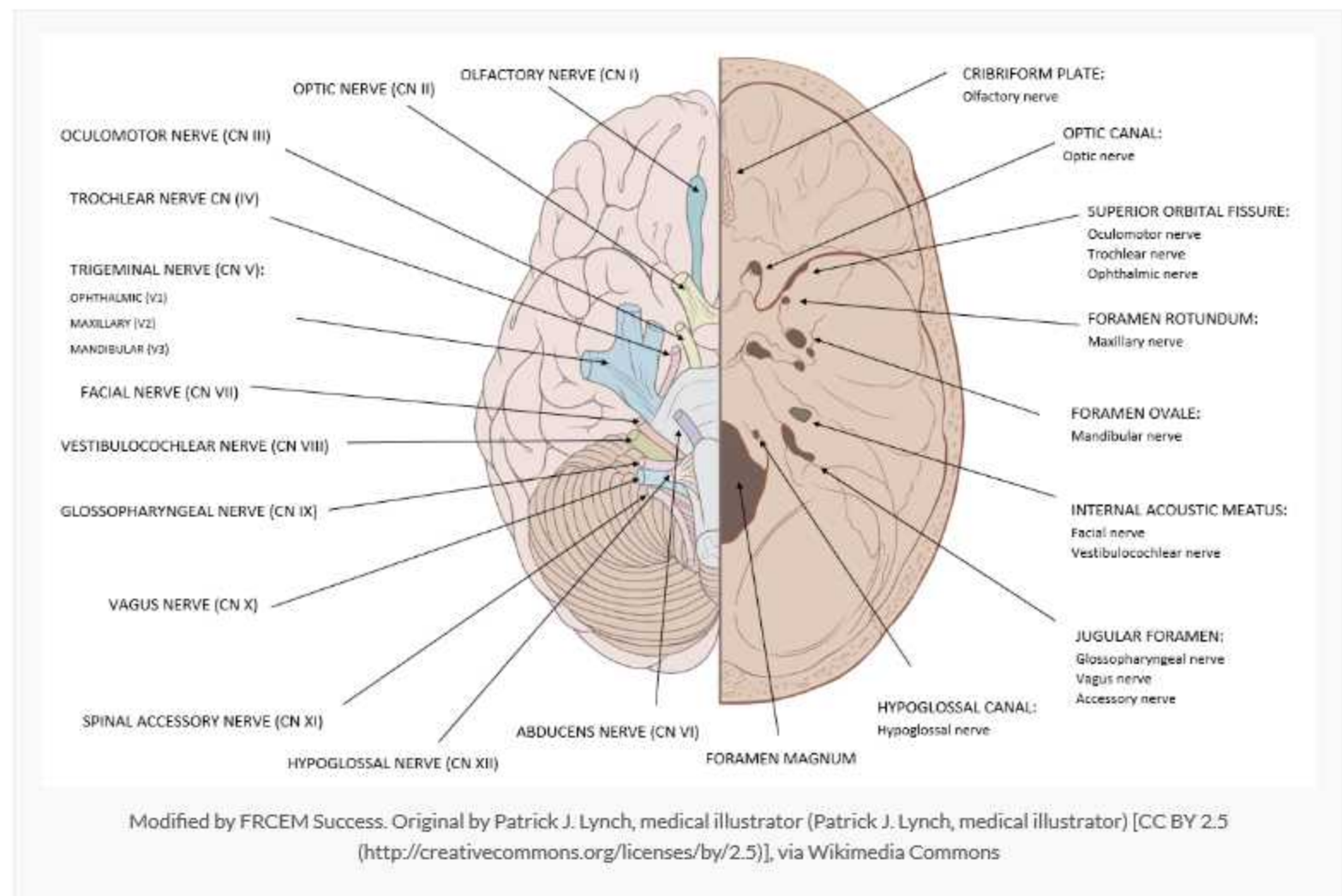
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory – innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

Question Navigator

37	Answered
38	Current Question
39	...
40	...
41	...
42	...
43	...
44	...
45	...
46	...
47	...
48	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 39 of 142



A 65 year old man has resting tremor, rigidity, bradykinesia and a shuffling gait. Parkinson's disease results from which of the following mechanisms:

- ☐ a A vascular lesion of the subthalamic nucleus
- ☐ b Loss of dopaminergic neurons in the substantia nigra
- ☒ c Loss of serotonergic neurons in the globus pallidus and red nucleus
- ☐ d Defect in the metabolism of copper
- ☐ e Loss of cholinergic and GABAergic neurons in the caudate nucleus and putamen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

37 Answered

38 Answered

39 Current Question

40 ...

41 ...

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk




Anatomy: CNS and CN lesions

Question 39 of 142

A 65 year old man has resting tremor, rigidity, bradykinesia and a shuffling gait. Parkinson's disease results from which of the following mechanisms:

- a) A vascular lesion of the subthalamic nucleus

b) **Loss of dopaminergic neurons in the substantia nigra** 

c) Loss of serotonergic neurons in the globus pallidus and red nucleus

d) Defect in the metabolism of copper

e) Loss of cholinergic and GABAergic neurons in the caudate nucleus and putamen

Answer

Parkinson's disease, characterised by resting tremor, rigidity, akinesia/bradykinesia and shuffling gait, results from degeneration of neurons in the substantia nigra resulting in depletion of dopamine in the caudate nucleus and putamen.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

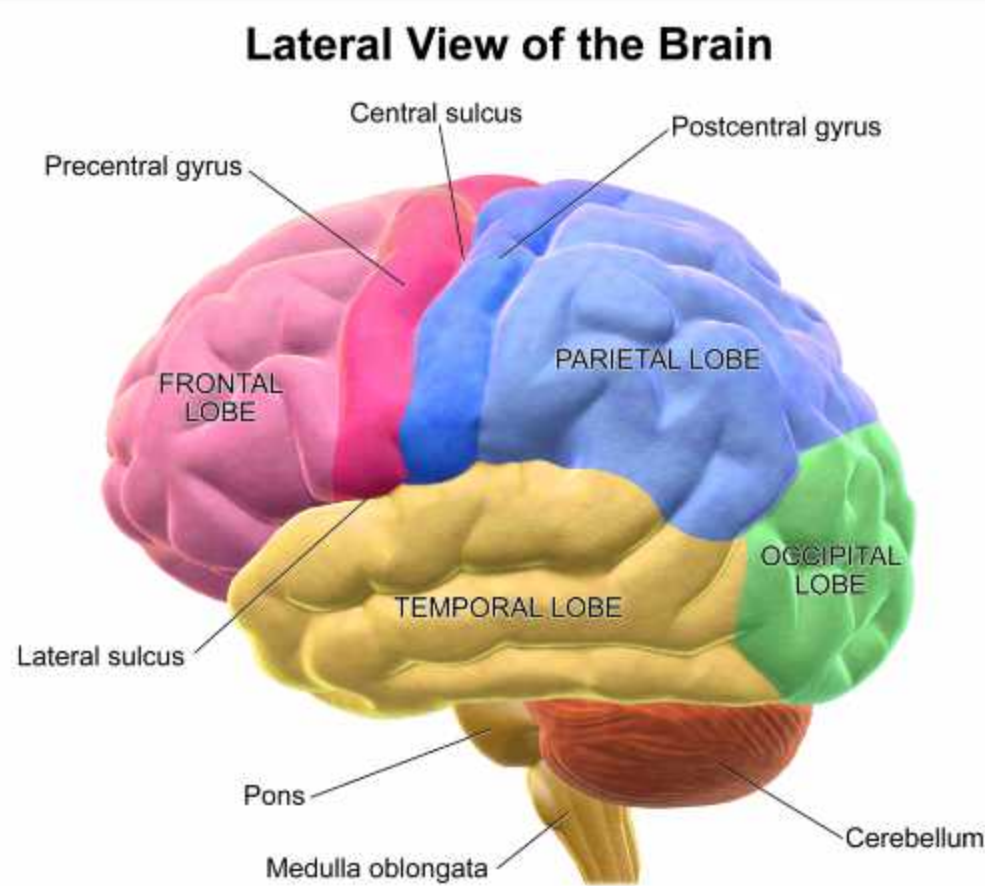
Cerebral cortex

The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidum. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

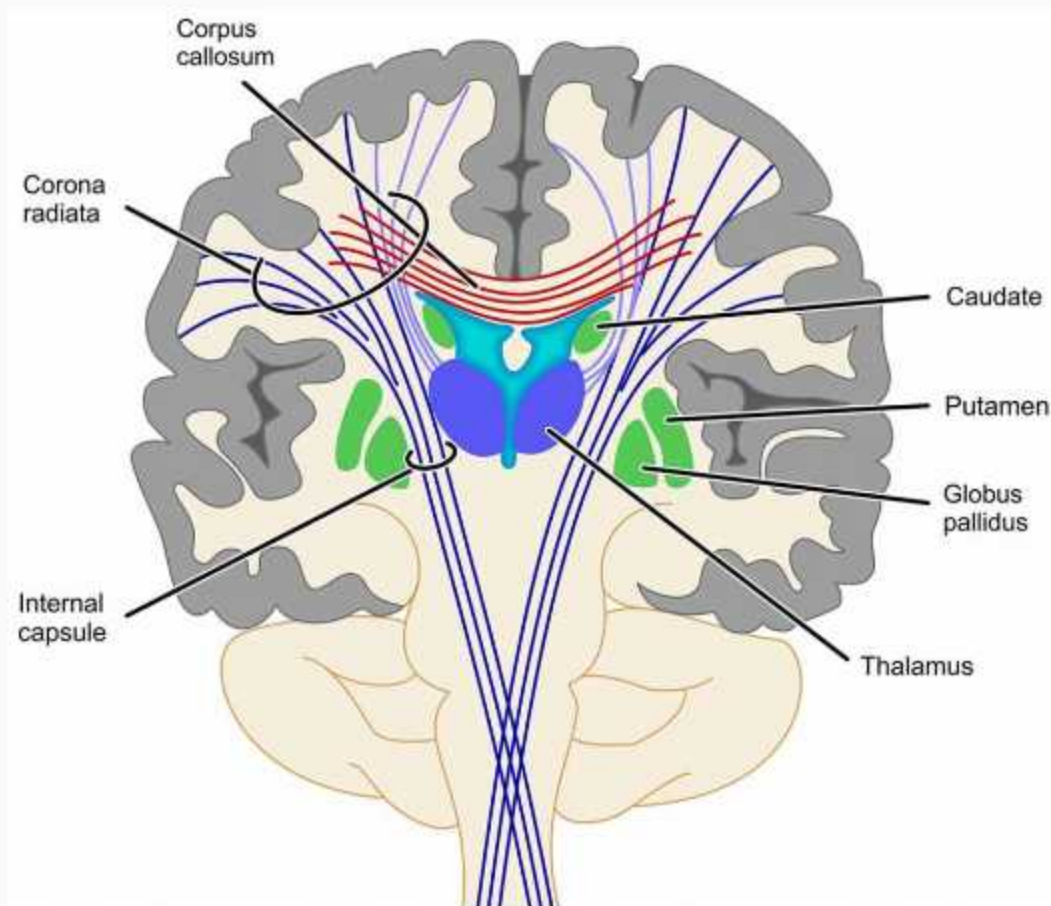
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

< Previous

Next >

Something wrong?

Question Navigator

37 Answered

38 Answered

39 Current Question

40 ...

41 ...

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



PayPal



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 40 of 142



A patient presents with spontaneous onset of left sided facial weakness but is otherwise well. He is unable to purse his lips, close his eyes fully or raise his eyebrows, which of the following is the most likely cause:

- ☐ a Ramsay-Hunt syndrome
- ☐ b Bell's palsy
- ☐ c Guillain-Barre syndrome
- ☐ d Multiple sclerosis
- ☐ e Stroke

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

37 Answered

38 Answered

39 Answered

40 Current Question

41 ...

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 40 of 142



A patient presents with spontaneous onset of left sided facial weakness but is otherwise well. He is unable to purse his lips, close his eyes fully or raise his eyebrows, which of the following is the most likely cause:

- a) Ramsay-Hunt syndrome
- b) **Bell's palsy** ✓
- c) Guillain-Barre syndrome
- d) Multiple sclerosis
- e) Stroke

Answer

The most common cause of isolated LMN facial nerve palsy is Bell's palsy.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

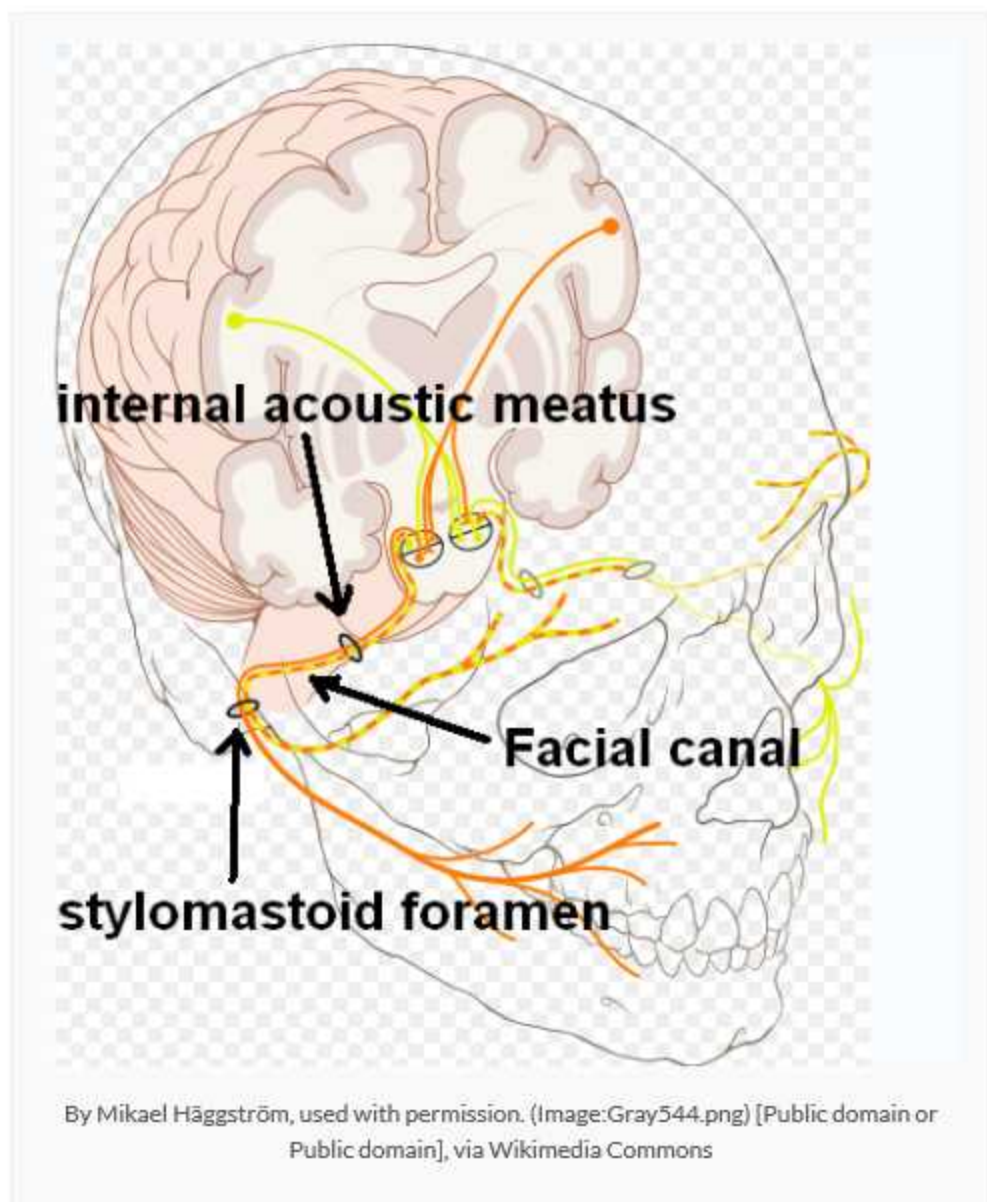
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

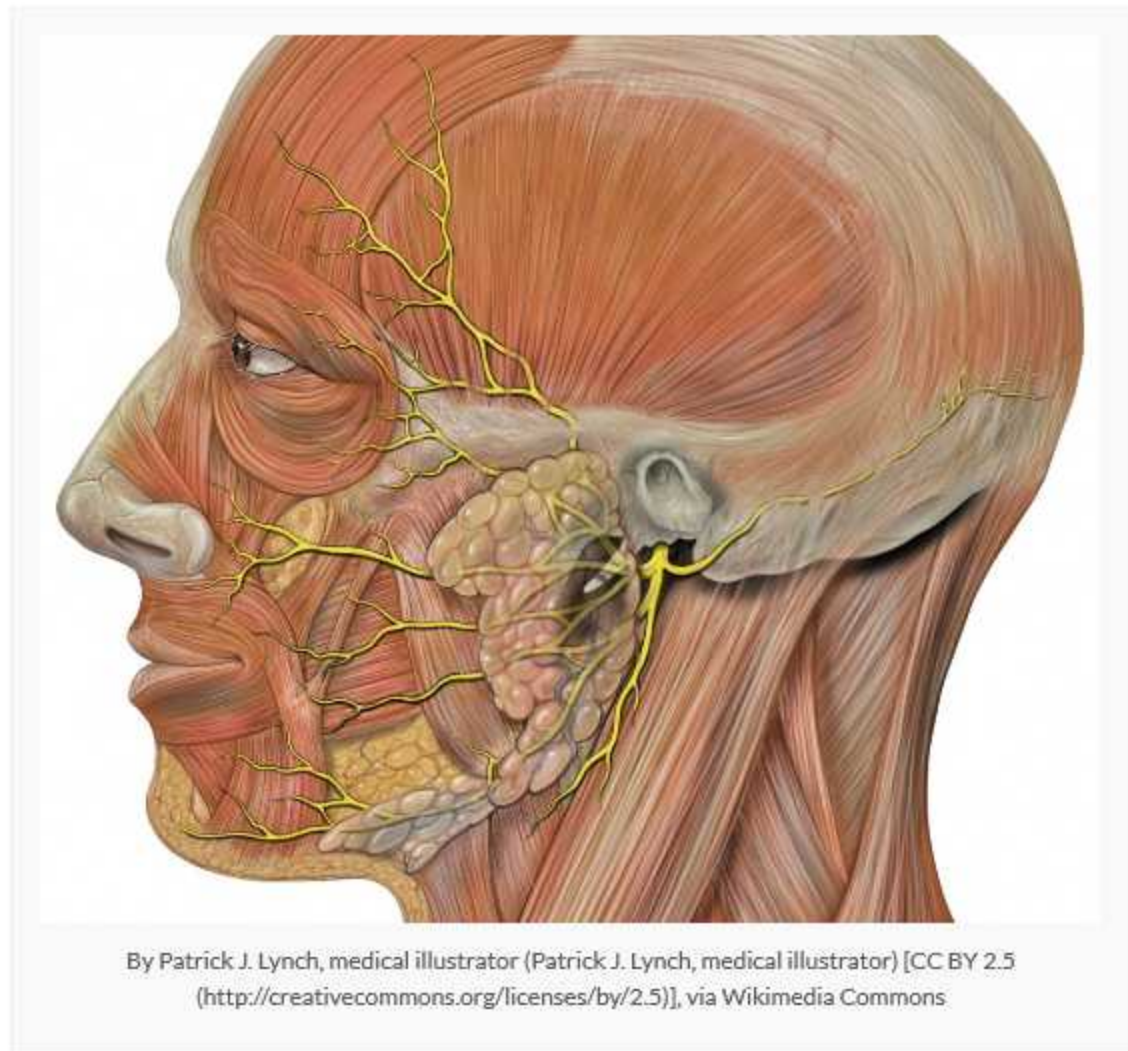
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[<< Previous](#)
[Next >>](#)
[Something wrong?](#)

Question Navigator

37	Answered
38	Answered
39	Answered
40	Current Question
41	...
42	...
43	...
44	...
45	...
46	...
47	...
48	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeInTheFastLane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 41 of 142



The inferior alveolar nerve innervates all of the following EXCEPT for the:

- ☐ a Mylohyoid muscle
- ☐ b Anterior belly of the digastric muscle
- ☐ c Tensor veli palatini muscle
- ☐ d Skin over the chin
- ☐ e Sensation from the lower teeth and associated gingiva

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

37 Answered

38 Answered

39 Answered

40 Answered

41 Current Question

42 ...

43 ...

44 ...

45 ...

46 ...

47 ...

48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 41 of 142

The inferior alveolar nerve innervates all of the following EXCEPT for the:

- a) Mylohyoid muscle
- b) Anterior belly of the digastric muscle
- c) Tensor veli palatini muscle
- d) Skin over the chin
- e) Sensation from the lower teeth and associated gingiva

Answer

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

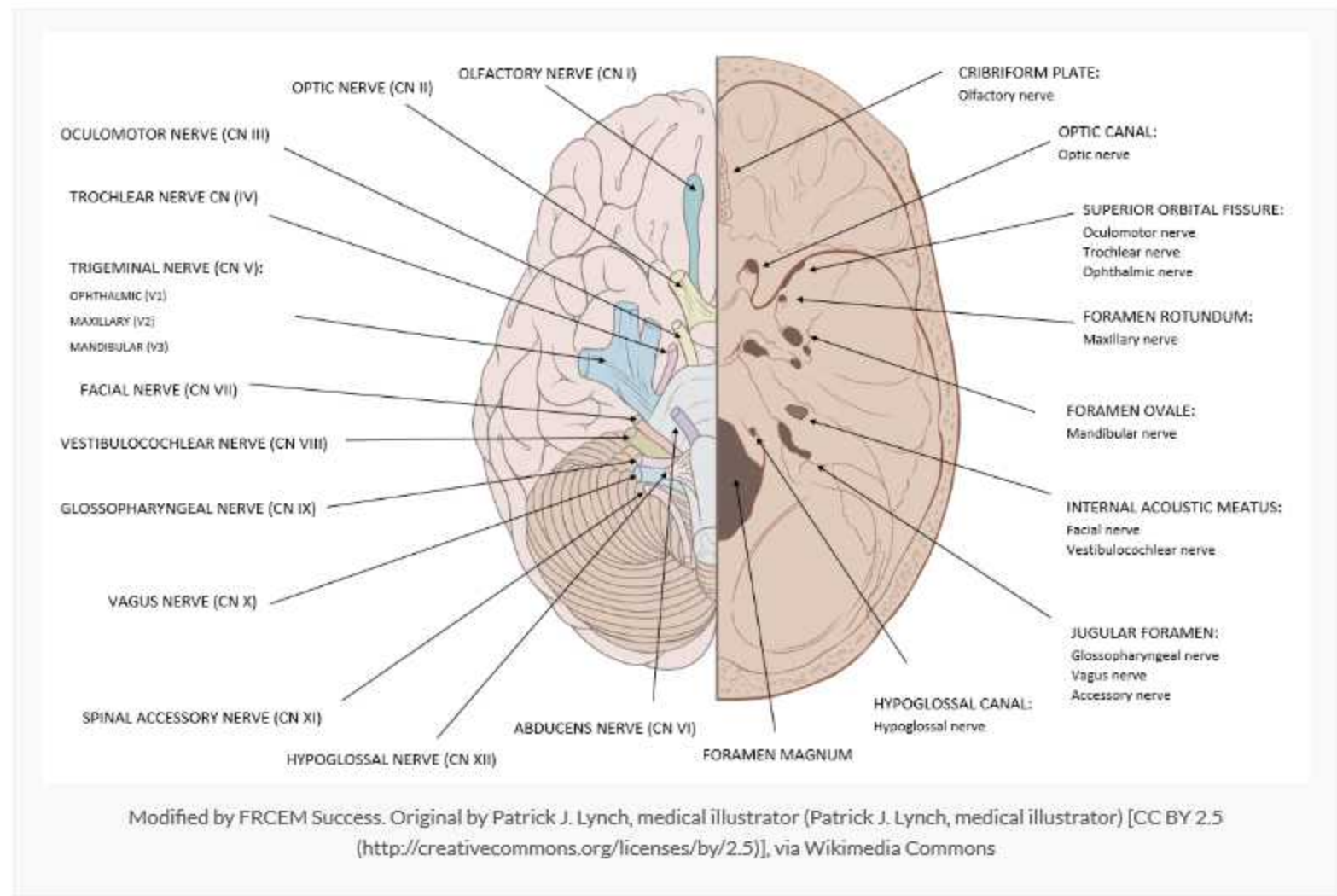
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory – innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

< Previous

Next >

Something wrong?

Question Navigator

37	Answered
38	Answered
39	Answered
40	Answered
41	Current Question
42	...
43	...
44	...
45	...
46	...
47	...
48	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 42 of 142



What type of visual field defect are you likely to see in a lesion of the temporal optic radiation:

- ☐ a Bitemporal hemianopia
- ☐ b Contralateral homonymous inferior quadrantanopia
- ☐ c Contralateral homonymous hemianopia
- ☐ d Contralateral homonymous superior quadrantanopia
- ☐ e Homonymous hemianopia with macular sparing

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Current Question
- 43 ...
- 44 ...
- 45 ...
- 46 ...
- 47 ...
- 48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 42 of 142

What type of visual field defect are you likely to see in a lesion of the temporal optic radiation:

- a) Bitemporal hemianopia
- b) Contralateral homonymous inferior quadrantanopia
- c) Contralateral homonymous hemianopia
- d) Contralateral homonymous superior quadrantanopia
- e) Homonymous hemianopia with macular sparing

Answer

A lesion of the temporal optic radiation will result in a contralateral homonymous superior quadrantanopia.

Notes

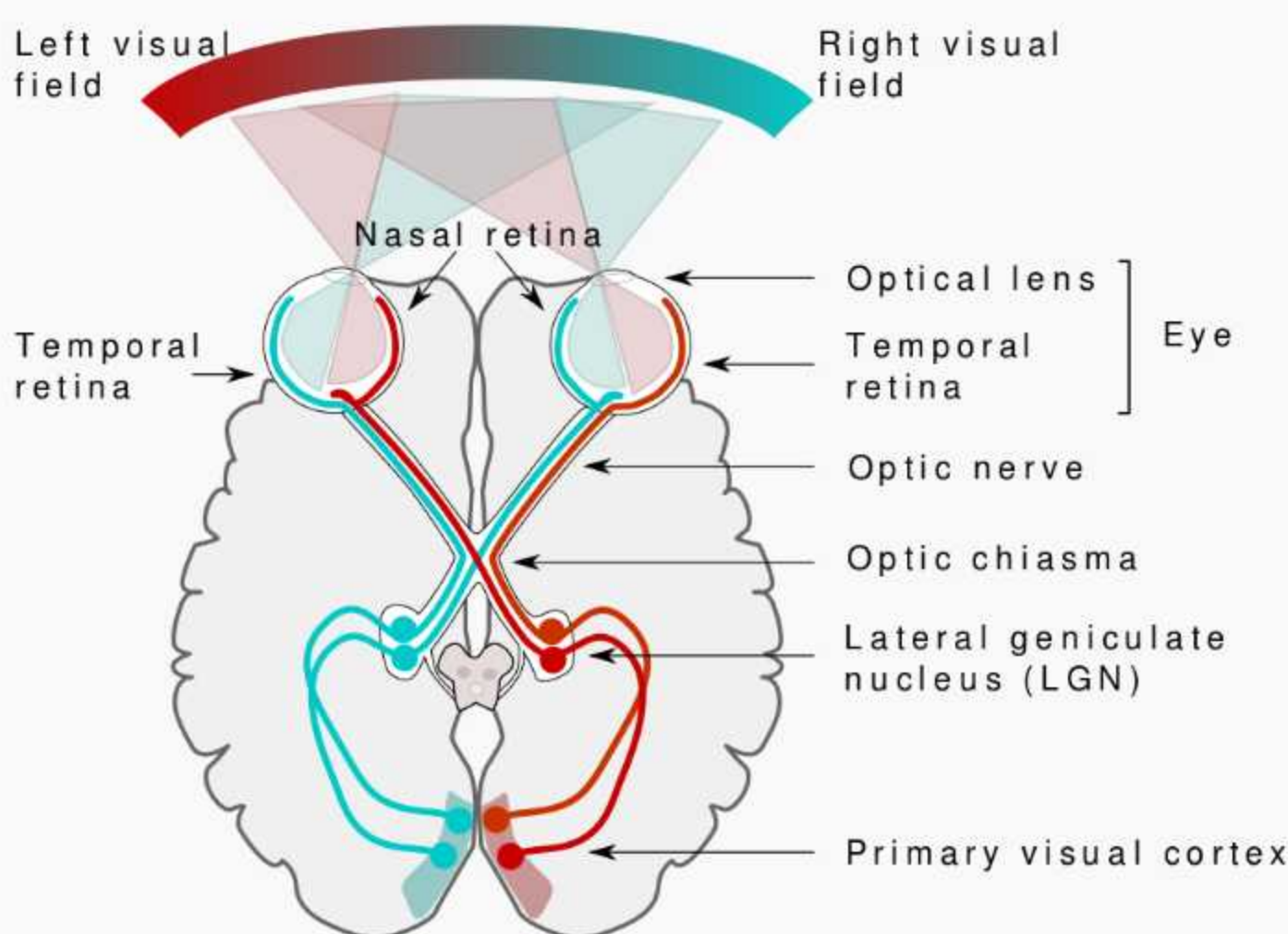
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

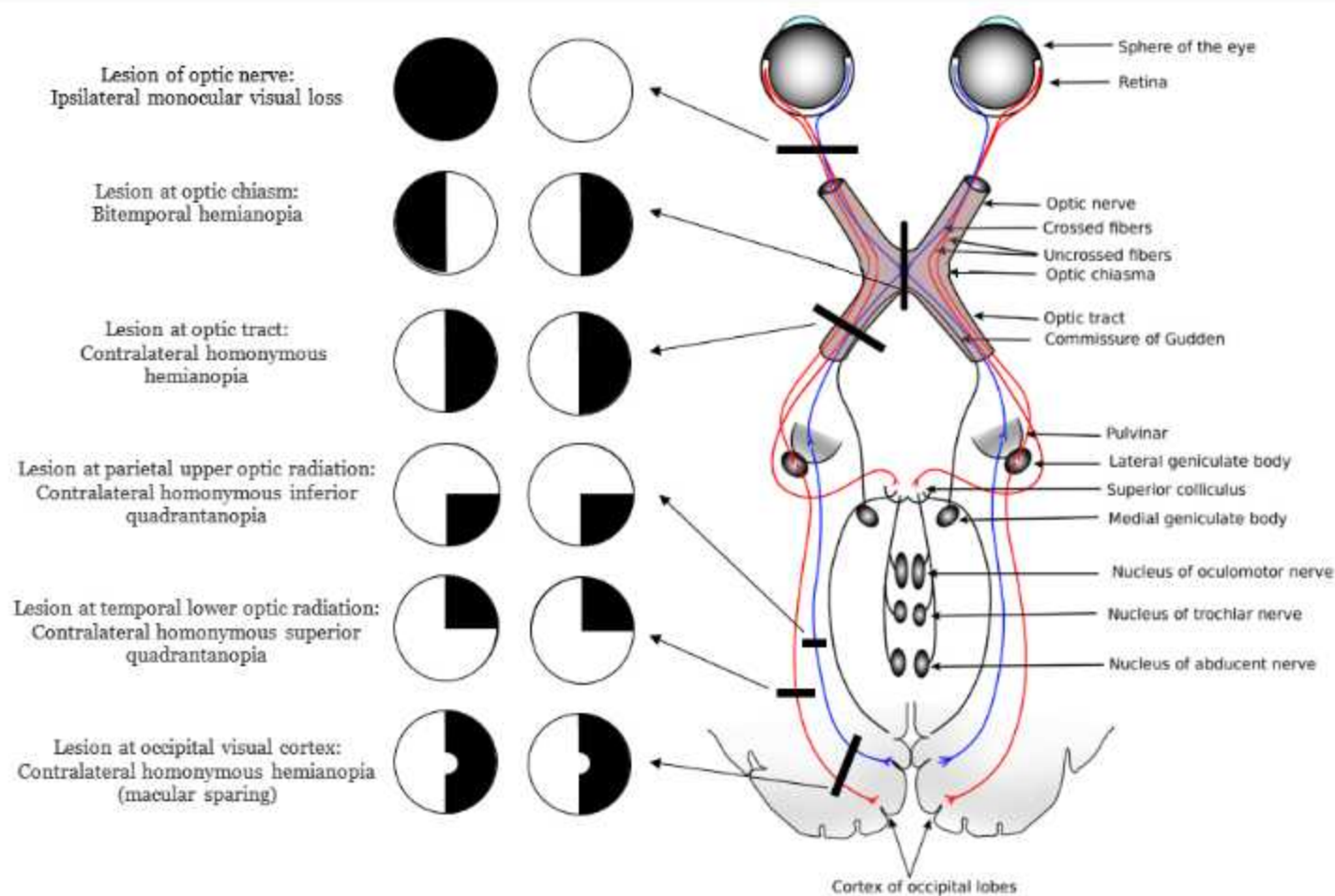
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

Question Navigator

37	Answered
38	Answered
39	Answered
40	Answered
41	Answered
42	Current Question
43	...
44	...
45	...
46	...
47	...
48	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 43 of 142



A 64 year old lady presents to ED with headaches. Imaging show a tumour compressing the structures in the internal auditory meatus. Which of the following structures are most likely affected:

- ☐ a Facial and accessory nerve
- ☐ b Facial and vestibulocochlear nerve
- ☐ c Vestibulocochlear nerve and trigeminal nerve
- ☐ d Vestibulocochlear nerve and glossopharyngeal nerve
- ☐ e Internal jugular vein and trigeminal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Current Question
- 44 ...
- 45 ...
- 46 ...
- 47 ...
- 48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 43 of 142



A 64 year old lady presents to ED with headaches. Imaging show a tumour compressing the structures in the internal auditory meatus. Which of the following structures are most likely affected:

- Facial and accessory nerve
- Facial and vestibulocochlear nerve** ✓
- Vestibulocochlear nerve and trigeminal nerve
- Vestibulocochlear nerve and glossopharyngeal nerve
- Internal jugular vein and trigeminal nerve

Answer

The internal auditory meatus transmits the facial and vestibulocochlear nerves.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

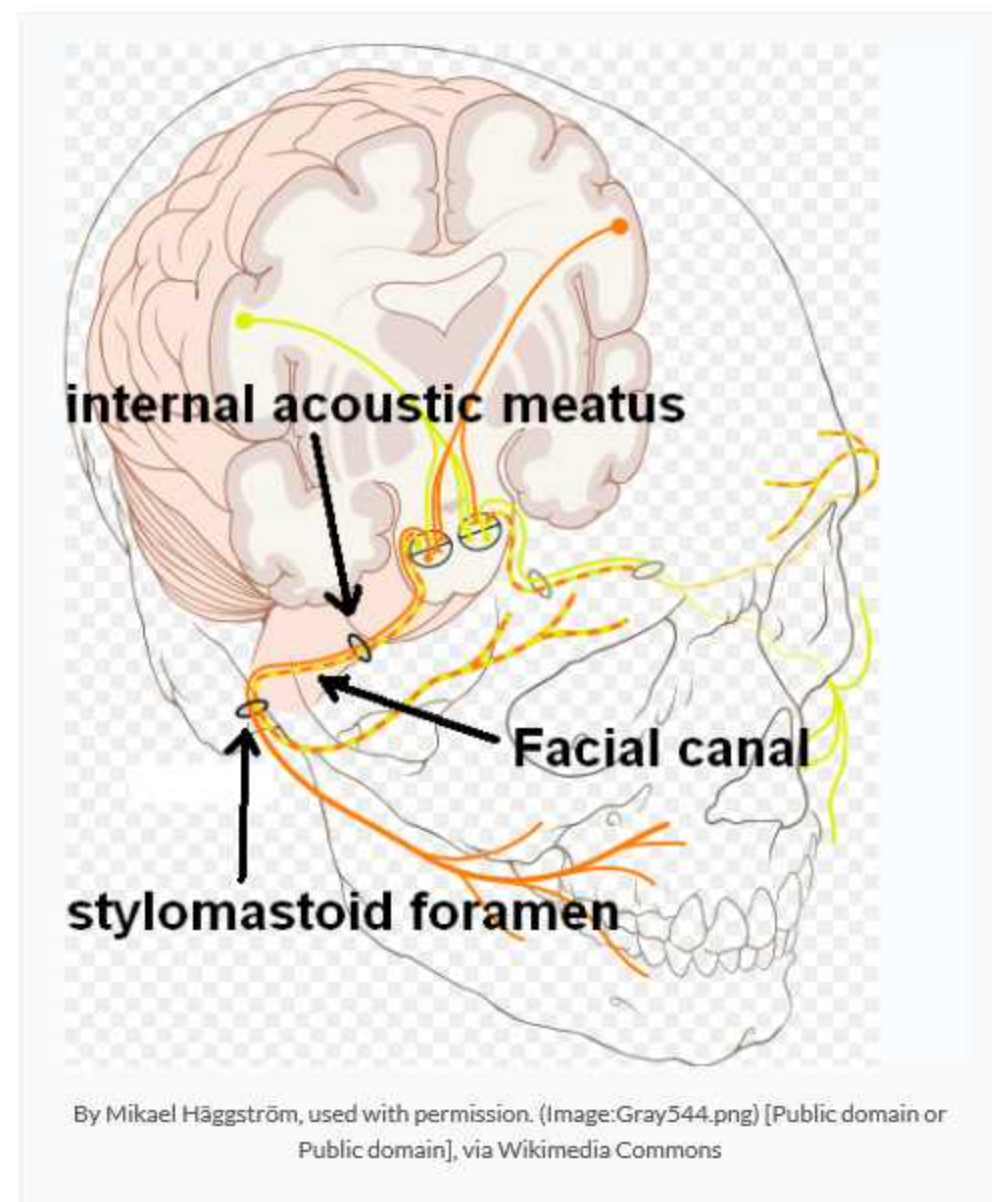
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

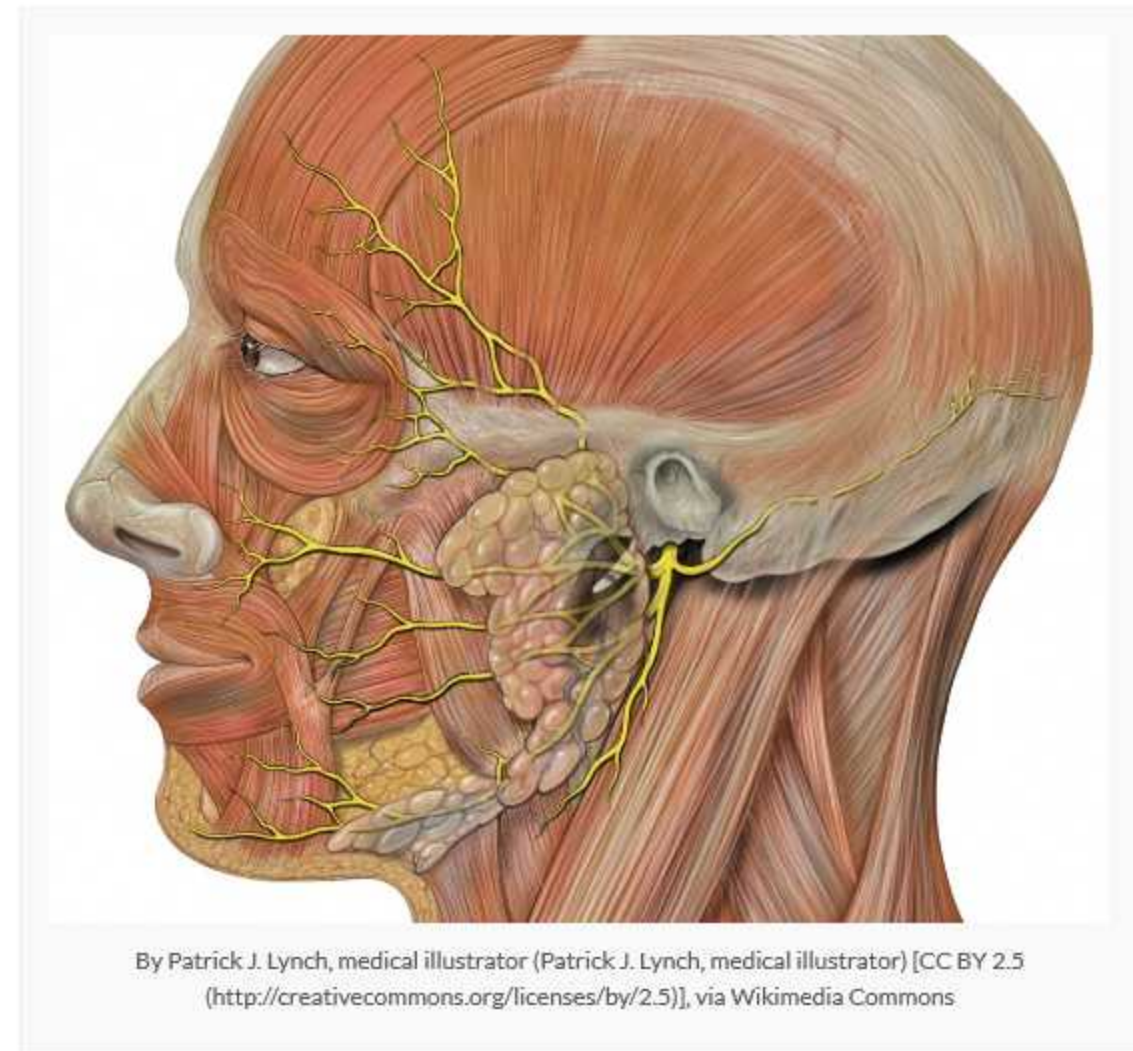
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[<< Previous](#)
[Next >>](#)
[Something wrong?](#)

Question Navigator

37	Answered
38	Answered
39	Answered
40	Answered
41	Answered
42	Answered
43	Current Question
44	...
45	...
46	...
47	...
48	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeInTheFastLane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 44 of 142



Damage to Wernicke's area will most likely result in which of the following clinical features:

- ☐ a Nystagmus
- ☐ b Dysarthria
- ☐ c Visual disturbance
- ☐ d Expressive dysphasia
- ☐ e Receptive dysphasia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Answered
- 44 Current Question
- 45 ...
- 46 ...
- 47 ...
- 48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 44 of 142

Damage to Wernicke's area will most likely result in which of the following clinical features:

- a) Nystagmus
- b) Dysarthria
- c) Visual disturbance
- d) Expressive dysphasia
- e) Receptive dysphasia

Answer

The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. Damage to this area results in a receptive dysphasia.

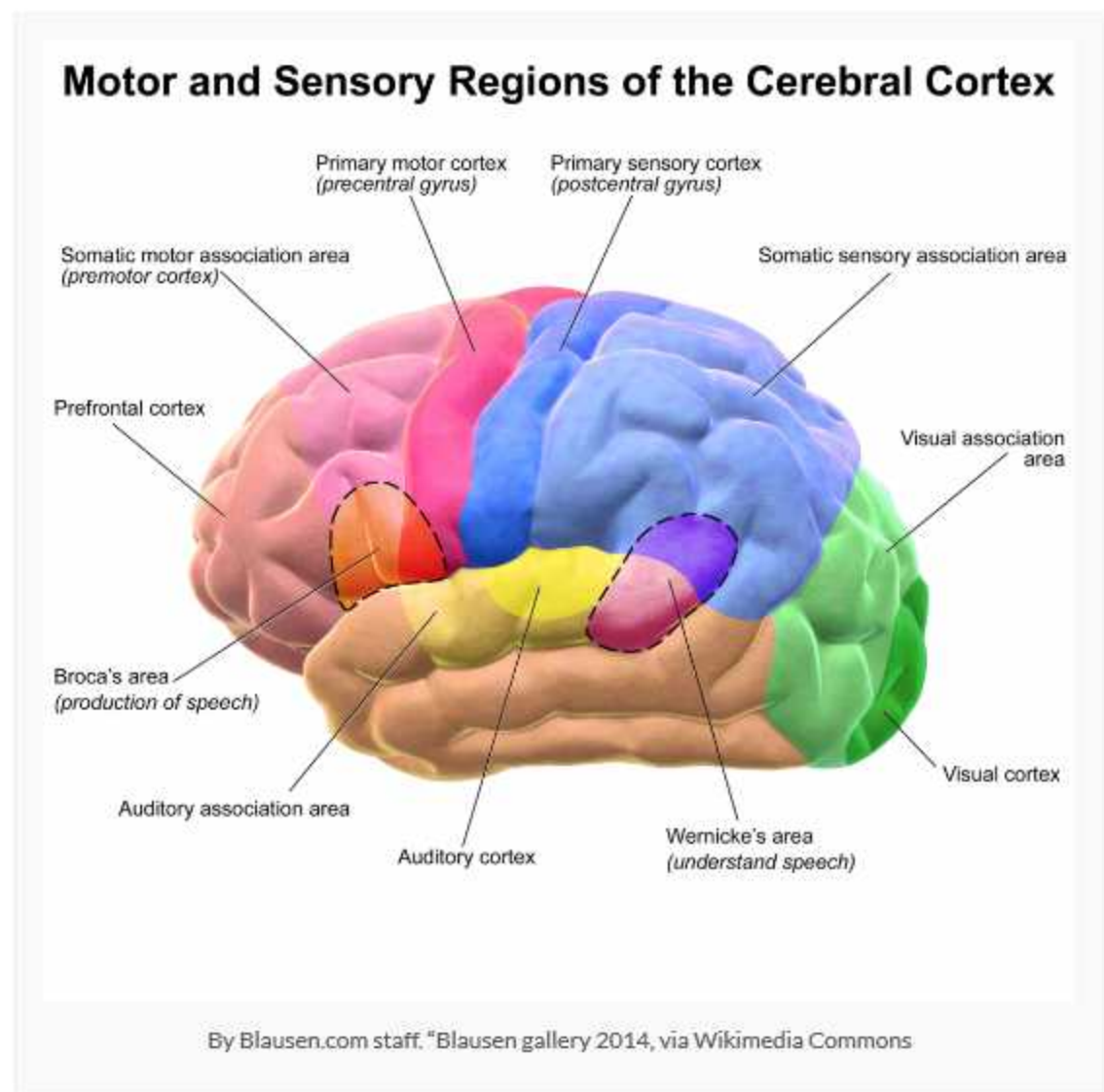
Notes

The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the frontal and parietal lobes, from which it is separated by the lateral sulcus.

Area	Function	Lesion
Wernicke speech area	Language comprehension	Receptive dysphasia
Primary auditory cortex and auditory association area	Perception and recognition of auditory stimuli	Partial cortical deafness, auditory agnosia
Limbic association cortex	Memory, learning, emotion	Memory impairment, increased aggression, difficulty recognising faces/objects
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous superior quadrantanopia

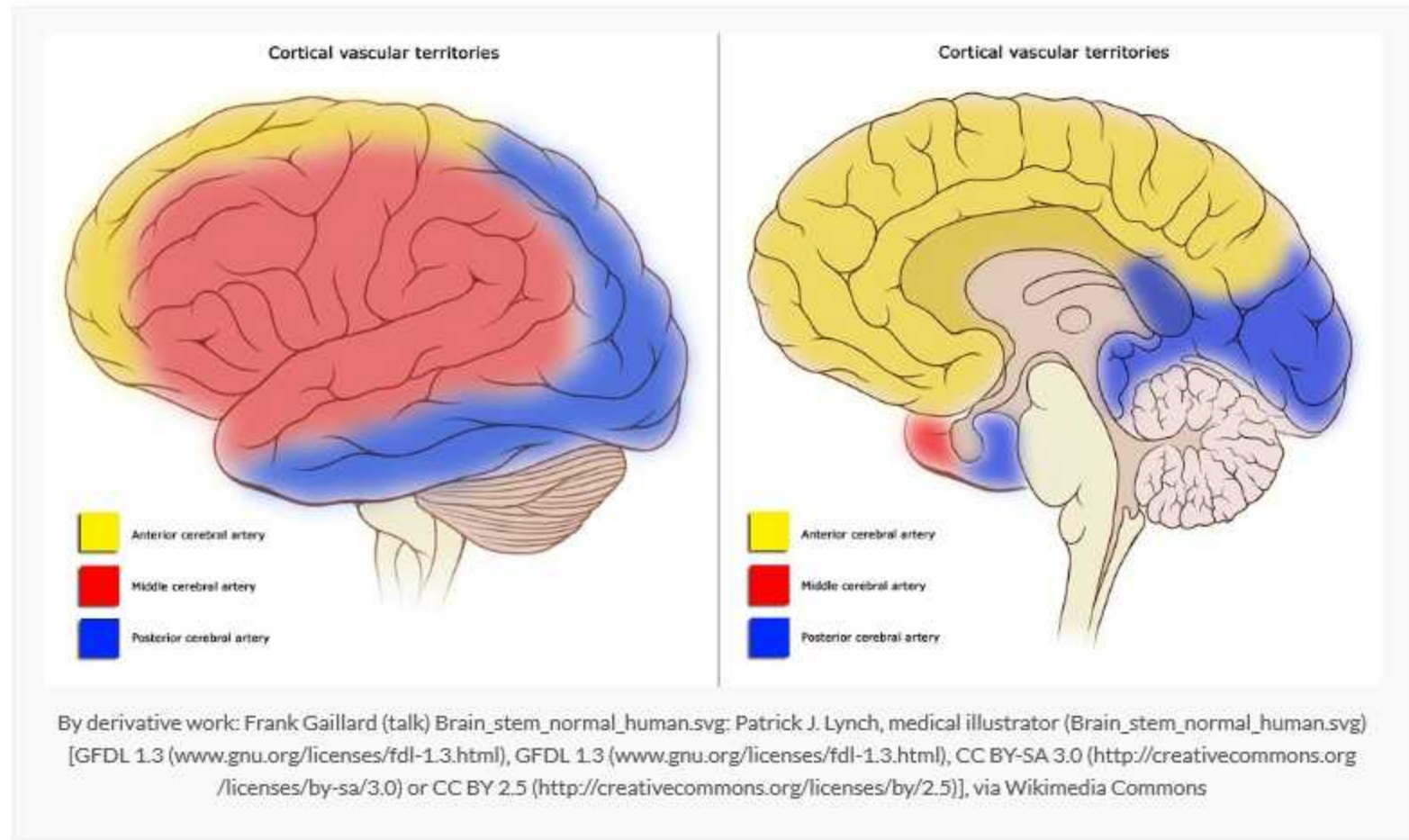
Areas of the temporal lobe

- The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. It is connected to the Broca speech area by the arcuate fasciculus.
- The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.
- The limbic association cortex is important in memory, learning and emotion.
- The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.



Blood supply

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).



Clinical implications

Damage to the temporal lobe may result in:

- Receptive dysphasia – damage to the Wernicke speech area
- Visual field defect (contralateral homonymous superior quadrantanopia) – damage to the optic radiation
- Memory impairment – damage to the limbic system
- Emotional and behavioural disturbances – damage to the limbic system
- Auditory agnosia – damage to the primary auditory cortex or auditory association areas
- Partial cortical deafness (due to bilateral cochlear representation) – damage to the primary auditory cortex

Question Navigator

37	Answered
38	Answered
39	Answered
40	Answered
41	Answered
42	Answered
43	Answered
44	Current Question
45	...
46	...
47	...
48	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 45 of 142



The auriculotemporal nerve carries general sensation from all of the following regions EXCEPT for the:

- ☐ a Posterior temple
- ☐ b External ear
- ☐ c Upper lip
- ☐ d Tympanic membrane
- ☐ e Temporomandibular joint

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Answered
- 44 Answered
- 45 Current Question
- 46 ...
- 47 ...
- 48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 45 of 142

The auriculotemporal nerve carries general sensation from all of the following regions EXCEPT for the:

- a) Posterior temple
- b) External ear
- c) Upper lip
- d) Tympanic membrane
- e) Temporomandibular joint

Answer

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

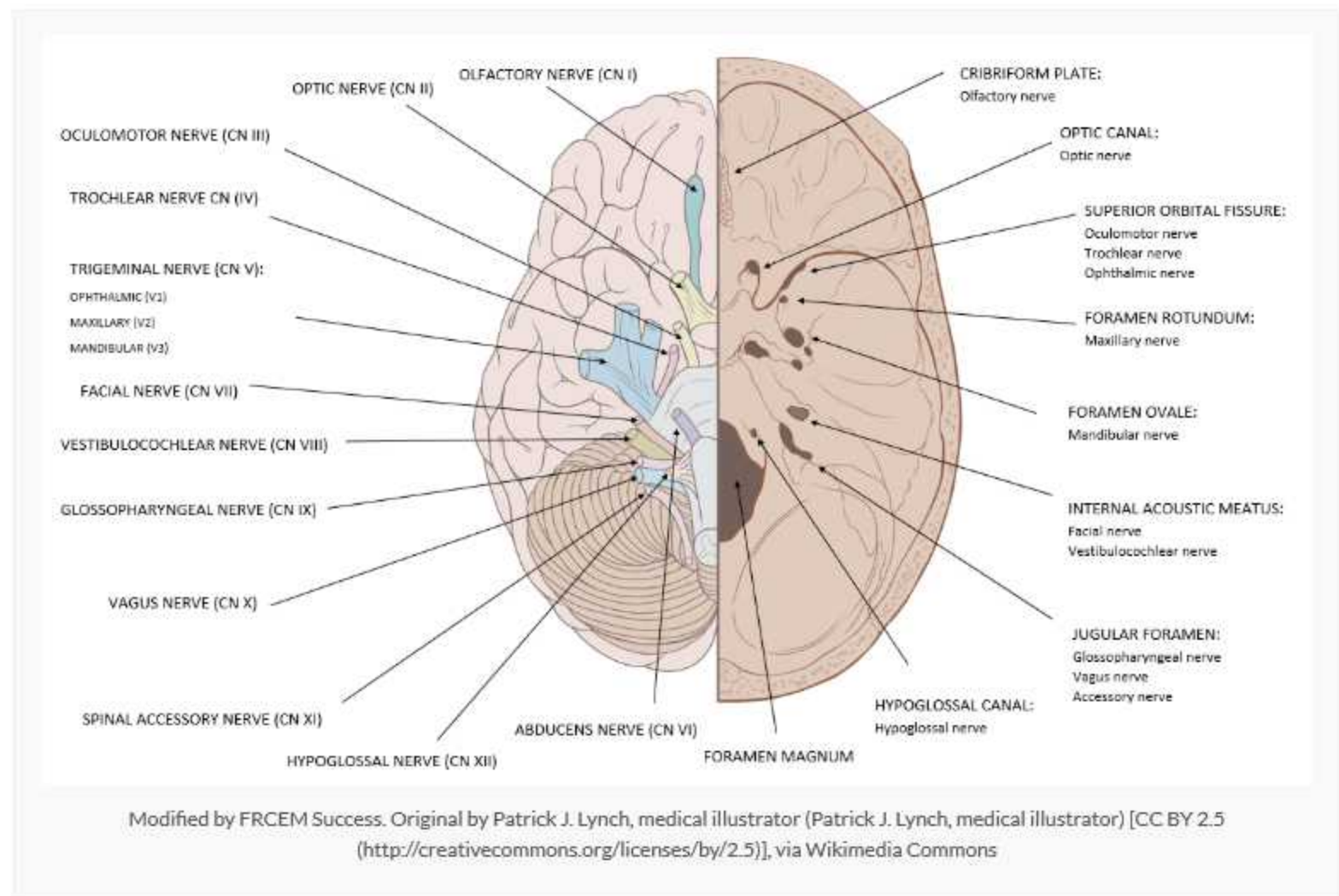
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory - innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

Question Navigator

37	Answered
38	Answered
39	Answered
40	Answered
41	Answered
42	Answered
43	Answered
44	Answered
45	Current Question
46	...
47	...
48	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 46 of 142

Which of the following is most likely to cause a bitemporal hemianopia:

- ☐ a Penetrating injury to the eye
- ☐ b Pituitary adenoma
- ☐ c Stroke
- ☐ d Frontal lobe tumour
- ☐ e Glaucoma

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)


Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Answered
- 44 Answered
- 45 Answered
- 46 Current Question
- 47 ...
- 48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 46 of 142



Which of the following is most likely to cause a bitemporal hemianopia:

- Penetrating injury to the eye
- Pituitary adenoma** ✓
- Stroke
- Frontal lobe tumour
- Glaucoma

Answer

A bitemporal hemianopia is most likely due to compression at the optic chiasm. This may be caused by pituitary tumour, craniopharyngioma, meningioma, optic glioma or aneurysm of the internal carotid artery.

Notes

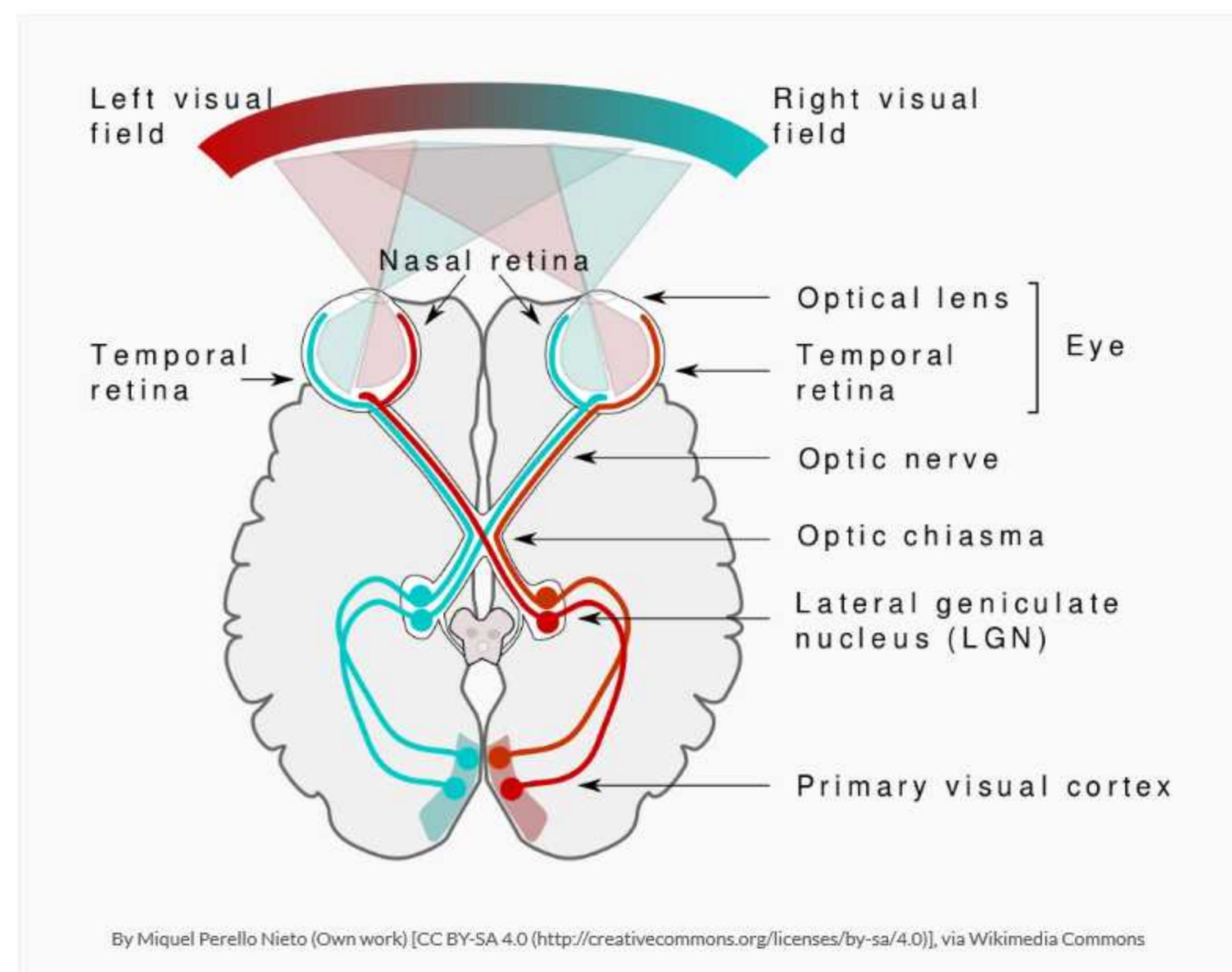
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

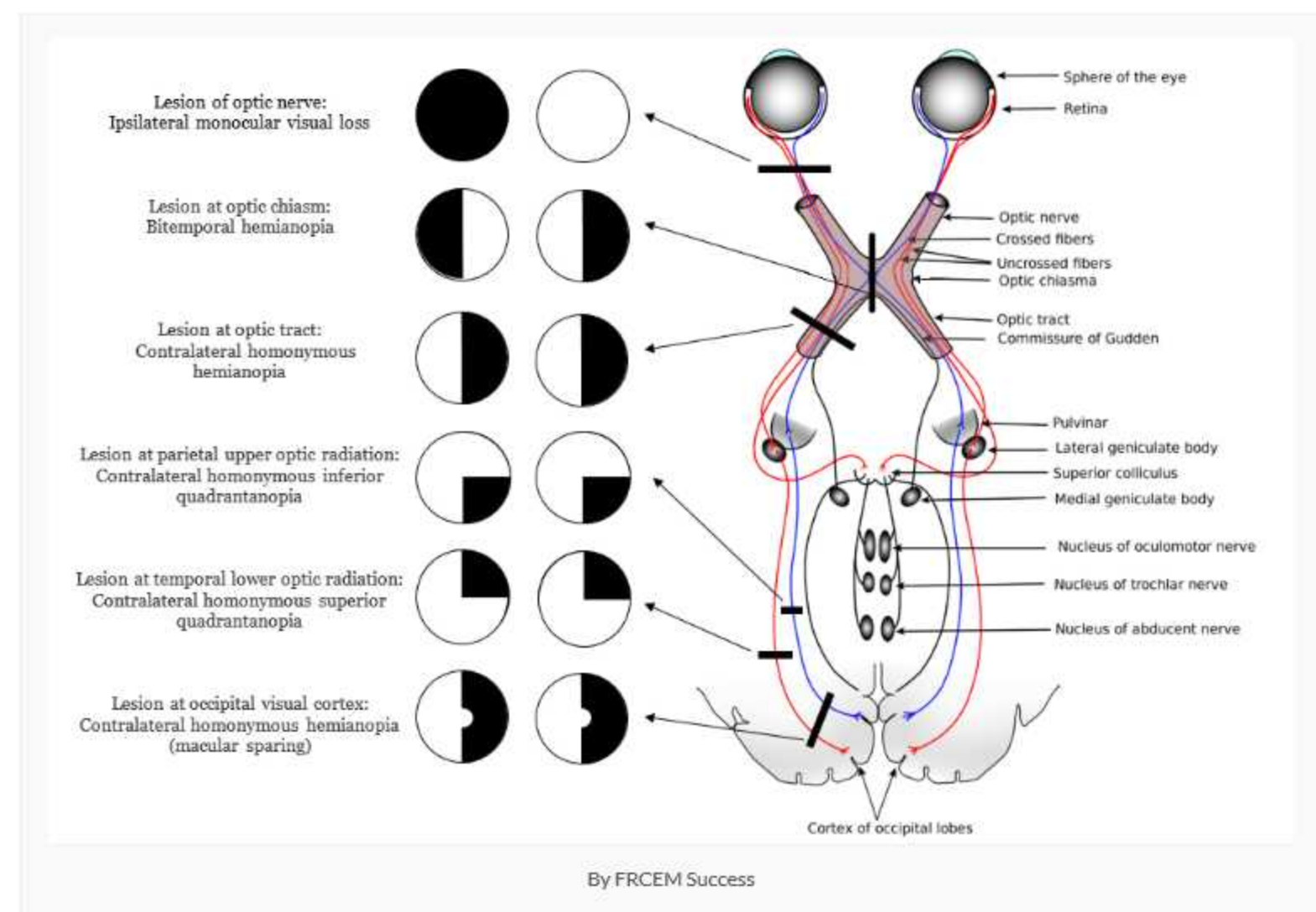
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours


[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Life in the Fast Lane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 47 of 142



Regarding the olfactory nerve, which of the following statements is CORRECT:

- ☐ a The olfactory bulb lies in the posterior cranial fossa.
- ☐ b The olfactory nerve is the longest cranial nerve.
- ☐ c The olfactory nerve originates from the medulla oblongata.
- ☐ d The olfactory nerve carries crude touch sensation from the nasal cavity.
- ☐ e The olfactory tract runs inferiorly to the frontal lobe.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Answered
- 44 Answered
- 45 Answered
- 46 Answered
- 47 Current Question
- 48 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 47 of 142



Regarding the olfactory nerve, which of the following statements is CORRECT:

- a) The olfactory bulb lies in the posterior cranial fossa.
- b) The olfactory nerve is the longest cranial nerve.
- c) The olfactory nerve originates from the medulla oblongata.
- d) The olfactory nerve carries crude touch sensation from the nasal cavity. ❌
- e) The olfactory tract runs inferiorly to the frontal lobe. ✅

Answer

The cranial nerve is the shortest cranial nerve and originates from the cerebrum; it is one of two nerves that do not originate from the brainstem, the other being the optic nerve. Olfactory nerve fibres enter the skull via the cribriform plate of the ethmoid bone to enter to olfactory bulb in the anterior cranial fossa before passing into the olfactory tract which lies inferior to the frontal lobe.

Notes

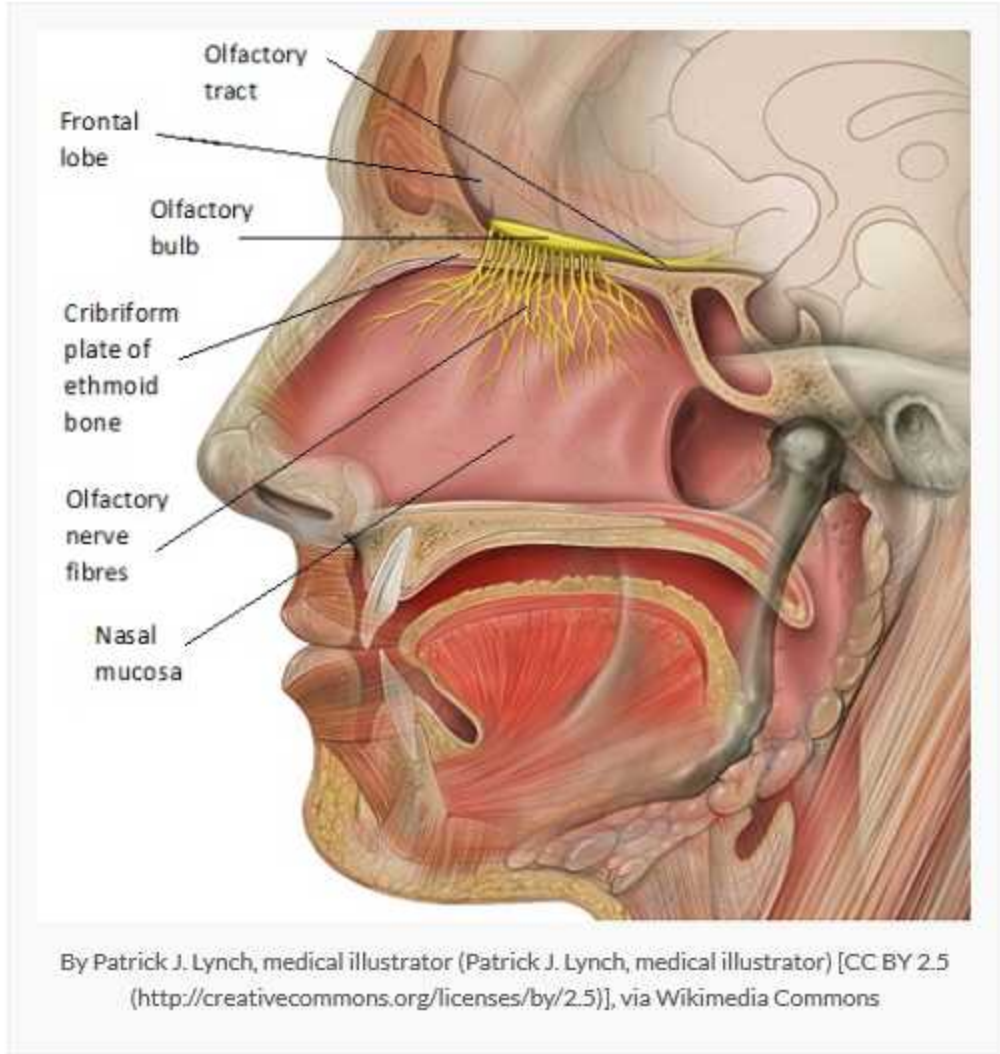
The olfactory nerve (CN I) is a sensory nerve responsible for the sense of smell.

Cranial nerve	Olfactory nerve (CN I)
Key anatomy	Nerve fibres enter cranial cavity via cribriform plate of ethmoid bone, olfactory bulb lies in anterior cranial fossa, olfactory tract runs inferior to frontal lobe
Function	Sensory: sense of smell
Assessment	Enquire about changes in smell/taste, formal assessment of smell
Clinical effects of injury	Anosmia (loss of smell) and taste
Causes of injury	Local nasal disease, tumour of frontal lobe, meningitis, trauma (e.g. fractured ethmoid bone, head injury)

Anatomical course

The olfactory nerve consists of a collection of unmyelinated axons of bipolar neurons located in the nasal mucosa which enter the skull via the foramina of the cribriform plate of the ethmoid bone. Once in the cranial cavity, the fibres enter the olfactory bulb which lies in the anterior cranial fossa and synapse, before second-order neurons pass posteriorly into the olfactory tract which runs inferiorly to the frontal lobe.

The cranial nerve is the shortest cranial nerve and originates from the cerebrum; it is one of two nerves that do not originate from the brainstem, the other being the optic nerve.



Assessment

The olfactory nerve is usually tested by asking the patient if they have noticed any problems with their sense of smell or taste; it can be formally tested using recognisable smells e.g. peppermint.

Clinical implications

Injury to the olfactory nerve causes anosmia (loss of sense of smell) with altered sense of taste.

Examples of causes of damage to the olfactory nerve include:

- Local nasal disease
- External pressure from a tumour of the frontal lobe
- Meningitis
- Trauma (most common, e.g. contrecoup injury from occipital head trauma, direct coup injury from frontal head trauma, fracture of cribriform plate)

Trauma is the most common cause of olfactory nerve injury and the olfactory nerve is the most commonly damaged nerve in head injury. All patients presenting with olfactory nerve dysfunction, especially following trauma, should be considered for CT scan.

Question Navigator

37	Answered
38	Answered
39	Answered
40	Answered
41	Answered
42	Answered
43	Answered
44	Answered
45	Answered
46	Answered
47	Current Question
48	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 48 of 142



A 55 year old woman presents to ED complaining of vertical diplopia with difficulty walking downstairs. She is tilting her head to one side as she says this helps ease the diplopia. Which of the following extraocular muscles is responsible for this picture:

- ☐ a Superior rectus
- ☐ b Inferior rectus
- ☐ c Superior oblique
- ☐ d Inferior oblique
- ☐ e Lateral rectus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Answered
- 44 Answered
- 45 Answered
- 46 Answered
- 47 Answered
- 48 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 48 of 142

A 55 year old woman presents to ED complaining of vertical diplopia with difficulty walking downstairs. She is tilting her head to one side as she says this helps ease the diplopia. Which of the following extraocular muscles is responsible for this picture:

a) Superior rectus
b) Inferior rectus
c) Superior oblique
d) Inferior oblique
e) Lateral rectus

Answer

The superior oblique, innervated by the trochlear nerve, acts to cause intorsion, depression and abduction of the eyeball. In trochlear nerve palsy the patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

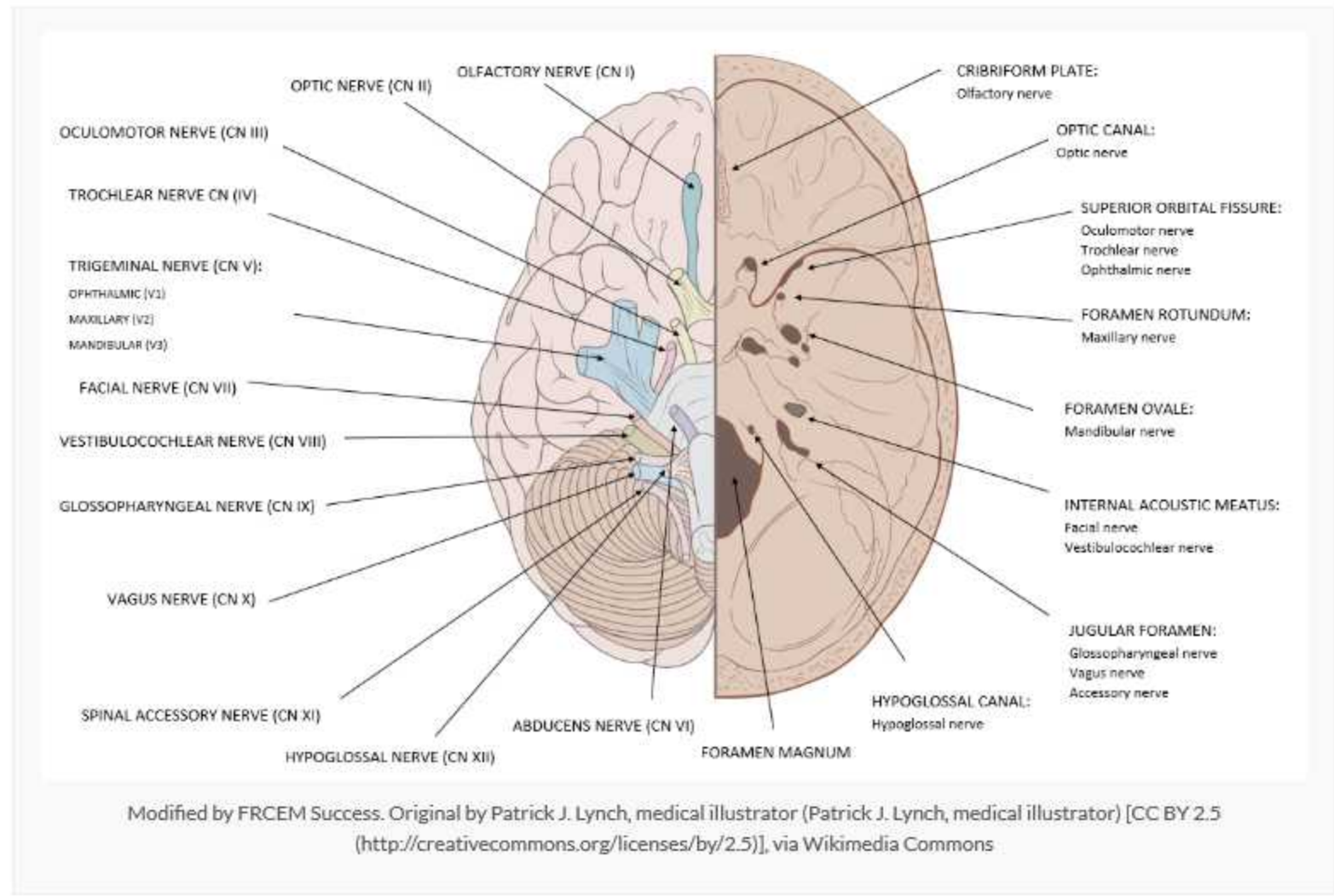
Notes

The trochlear nerve (CN IV) is a motor nerve supplying the superior oblique muscle of the eye.

Cranial nerve	Trochlear nerve (CN IV)
Key anatomy	Arises from midbrain, travels through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: superior oblique muscle of eye (intorsion, depression and abduction of eye)
Assessment	Eye movements
Clinical effects of injury	Weakness of downward gaze (difficulty reading/walking downstairs), vertical diplopia, eye is extorted and may be elevated (patient head tilts to opposite side to compensate)
Causes of injury	Idiopathic, trauma, microvasculopathy, cavernous sinus disease, raised intracranial pressure

Anatomical course

It is the smallest cranial nerve but has the longest cranial course. It arises from the trochlear nucleus and decussates within the midbrain, emerging from the posterior aspect of the midbrain. It runs anteroinferiorly within the subarachnoid space before piercing the dura and travelling along the lateral wall of the cavernous sinus, before entering the orbit of the eye via the superior orbital fissure.



Function

The superior oblique primarily rotates the top of the eye towards the nose (intorsion). Secondly, it moves the eye downward (depression) and outward (abduction). It prevents the unopposed action of the superior rectus which would otherwise rotate the globe.

Clinical implications

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

Causes of damage include:

- Idiopathic (most commonly)
- Trauma
- Microvasculopathy (associated with diabetes and hypertension)
- Multiple sclerosis
- Lesions in the midbrain
- Cavernous sinus disease
- Raised intracranial pressure

Question Navigator

- 37 Answered
- 38 Answered
- 39 Answered
- 40 Answered
- 41 Answered
- 42 Answered
- 43 Answered
- 44 Answered
- 45 Answered
- 46 Answered
- 47 Answered
- 48 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 49 of 142



A 28 year old man presents to ED complaining of severe headaches and dizziness. Imaging shows a tumour compressing the hypoglossal canal. Which of the following clinical features would you most expect to see:

- ☐ a Dysphagia
- ☐ b Dysarthria
- ☐ c Uvula deviation away from affected side
- ☐ d Tongue deviation on protrusion towards affected side
- ☐ e Loss of gag reflex

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

49 Current Question

50 ...

51 ...

52 ...

53 ...

54 ...

55 ...

56 ...

57 ...

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 49 of 142

A 28 year old man presents to ED complaining of severe headaches and dizziness. Imaging shows a tumour compressing the hypoglossal canal. Which of the following clinical features would you most expect to see:

- a) Dysphagia
- b) Dysarthria
- c) Uvula deviation away from affected side
- d) Tongue deviation on protrusion towards affected side
- e) Loss of gag reflex

Answer

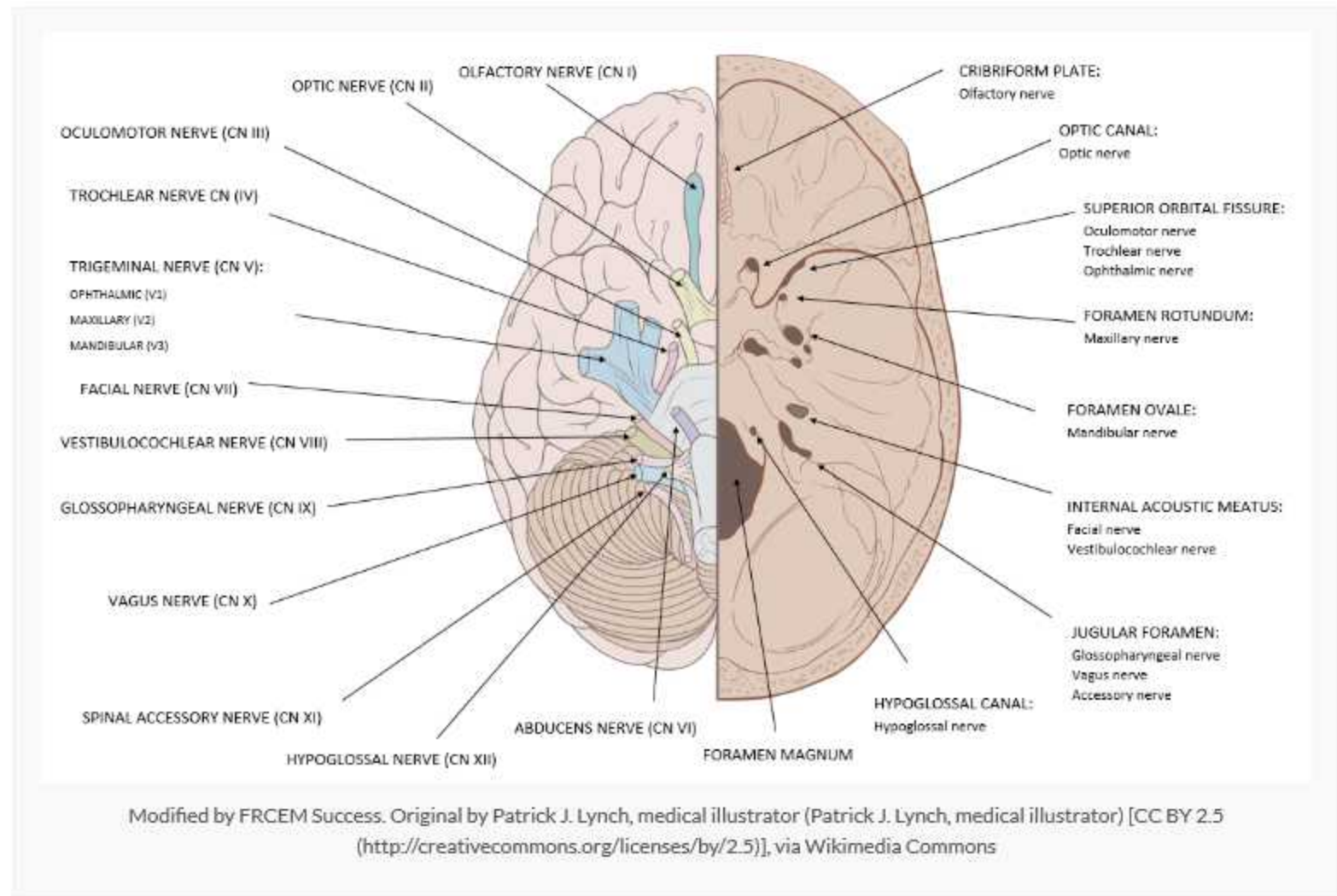
The hypoglossal nerve exits the cranial cavity through the hypoglossal canal. Injury to the hypoglossal nerve will result in ipsilateral tongue weakness, atrophy and fasciculations, with tongue deviation on protrusion towards the affected side due to the unopposed action of the opposite genioglossus muscle.

Notes

Cranial nerve	Hypoglossal nerve (CN XII)
Key anatomy	Arises from medulla, exits skull through hypoglossal canal
Function	Motor: all intrinsic and extrinsic muscles of tongue (except for palatoglossus)
Assessment	Power and symmetry of tongue, tongue protrusion to look for deviation
Clinical effects of injury	Hemiparalysis of tongue with wasting and fasciculations, tongue deviation towards weak side
Causes of injury	Penetrating trauma, tumours, meningitis, extension of middle ear infection

Key anatomy

The hypoglossal nerve (CN XII) arises from the medulla and passes laterally across the posterior cranial fossa within the subarachnoid space before emerging from the cranial cavity via the hypoglossal canal. It then passes inferiorly to the angle of the mandible and moves in an anterior direction to enter the tongue.



Function

It innervates the hypoglossus, the genioglossus, the styloglossus and all of the intrinsic muscles of the tongue (i.e. all the muscles of the tongue except for the extrinsic palatoglossus muscle innervated by the vagus nerve).

Assessment

The hypoglossal nerve is assessed by asking the patient to protrude their tongue to look for deviation and testing power of the tongue by asking the patient to push their tongue against their cheek.

Clinical implications

In CN XII palsy there is hemiparalysis of the tongue associated with muscle wasting and fasciculations. The tongue deviates towards the weak side upon protrusion due to the unopposed action of the opposite genioglossus.

Isolated hypoglossal nerve injury is relatively uncommon. Possible causes include penetrating traumatic injuries, tumours (e.g. metastases, neurofibroma, cerebellopontine angle lesions), meningitis and infection from the middle ear spreading into the posterior fossa.

Question Navigator

49	Current Question
50	...
51	...
52	...
53	...
54	...
55	...
56	...
57	...
58	...
59	...
60	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 50 of 142



Which of the following clinical features is NOT typical of a facial nerve palsy:

- ☐ a Hyperacusis
- ☐ b Reduced salivation
- ☒ c Reduced lacrimal fluid production
- ☐ d Impaired sense of taste
- ☐ e Inability to raise the eyelid

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

49 Answered

50 Current Question

51 ...

52 ...

53 ...

54 ...

55 ...

56 ...

57 ...

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 50 of 142



Which of the following clinical features is NOT typical of a facial nerve palsy:

- a) Hyperacusis
- b) Reduced salivation
- c) Reduced lacrimal fluid production
- d) Impaired sense of taste
- e) **Inability to raise the eyelid** ✓

Answer

Facial nerve palsy can result in inability to close the eye due to paralysis of the orbicularis oculi muscle. Elevation of the eyelid in eye opening is a function of the levator palpebrae superioris muscle and the superior tarsal muscle, innervated by the oculomotor nerve and the sympathetic chain respectively.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

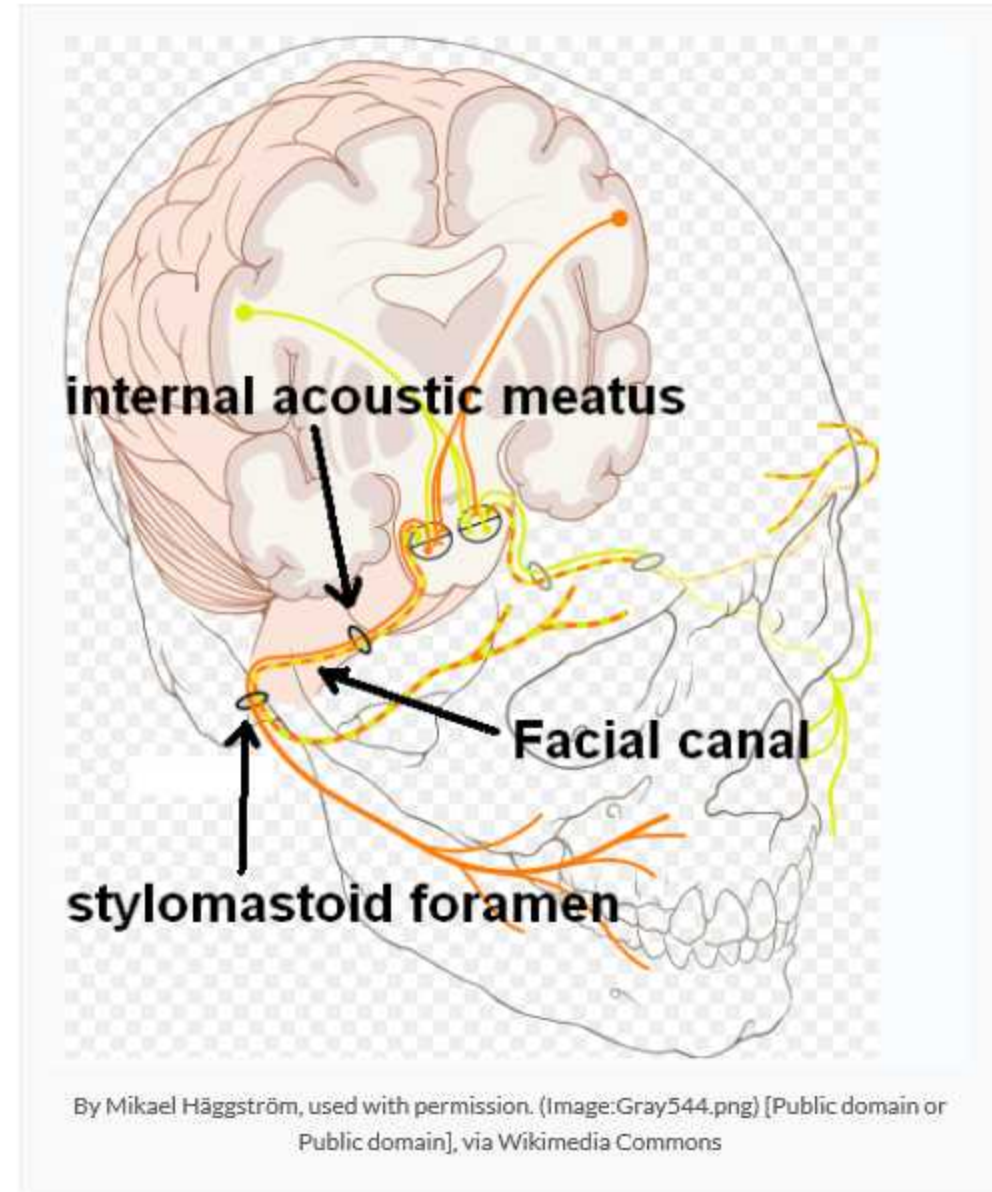
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

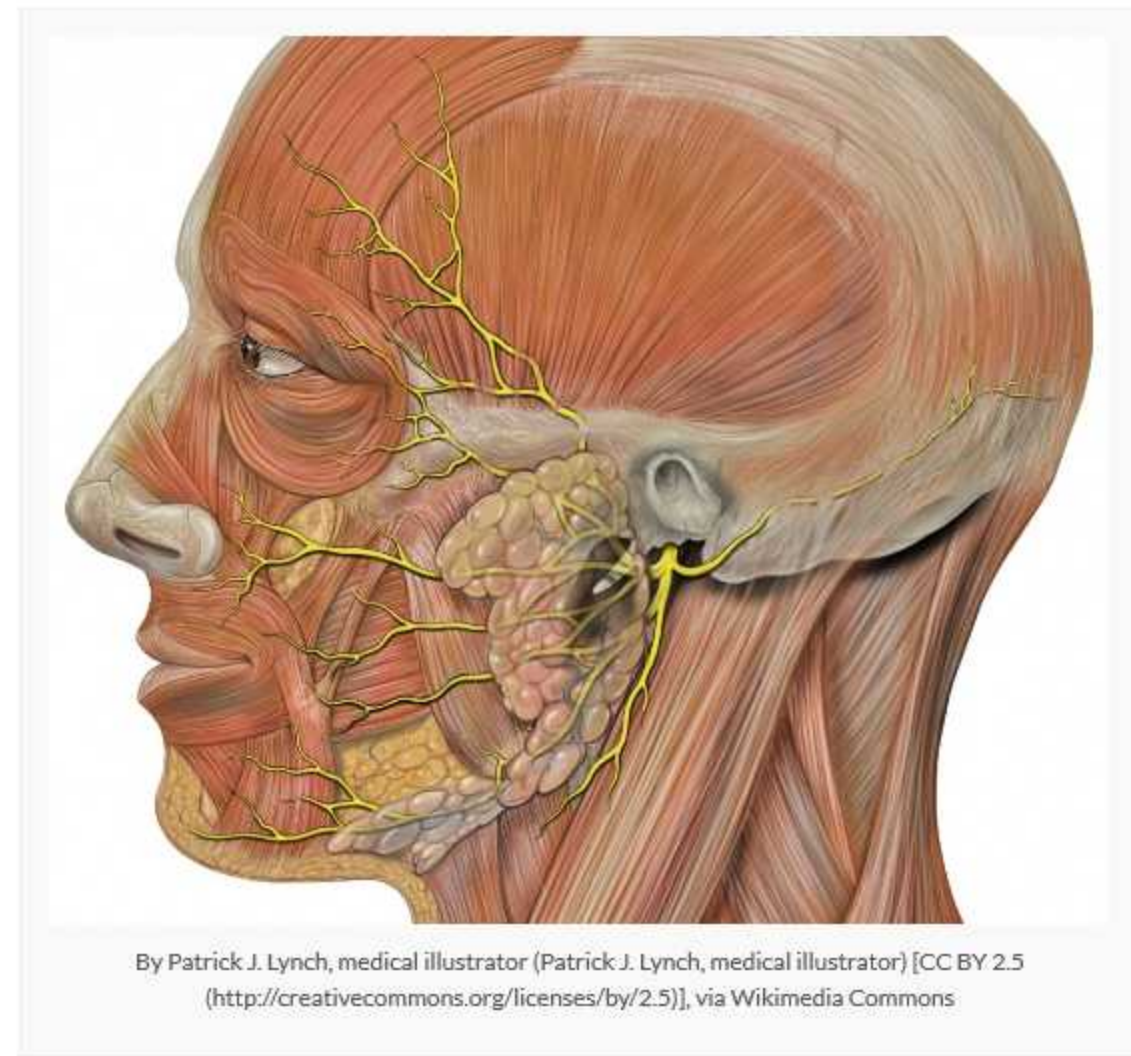
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[< Previous](#)
[Next >](#)

Something wrong?

Question Navigator

49 Answered

50 Current Question

51 ...

52 ...

53 ...

54 ...

55 ...

56 ...

57 ...

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 51 of 142



A 64 year old man has sustained a penetrating injury to the submandibular triangle. On examination, his tongue is weak and when protruded deviates to the left. Which of the following nerves has most likely been injured:

- ☐ a Left glossopharyngeal nerve
- ☐ b Right glossopharyngeal nerve
- ☐ c Left hypoglossal nerve
- ☐ d Right hypoglossal nerve
- ☐ e Right lingual nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

49 Answered

50 Answered

51 Current Question

52 ...

53 ...

54 ...

55 ...

56 ...

57 ...

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 51 of 142

A 64 year old man has sustained a penetrating injury to the submandibular triangle. On examination, his tongue is weak and when protruded deviates to the left. Which of the following nerves has most likely been injured:

- a) Left glossopharyngeal nerve
- b) Right glossopharyngeal nerve
- c) Left hypoglossal nerve
- d) Right hypoglossal nerve
- e) Right lingual nerve

Answer

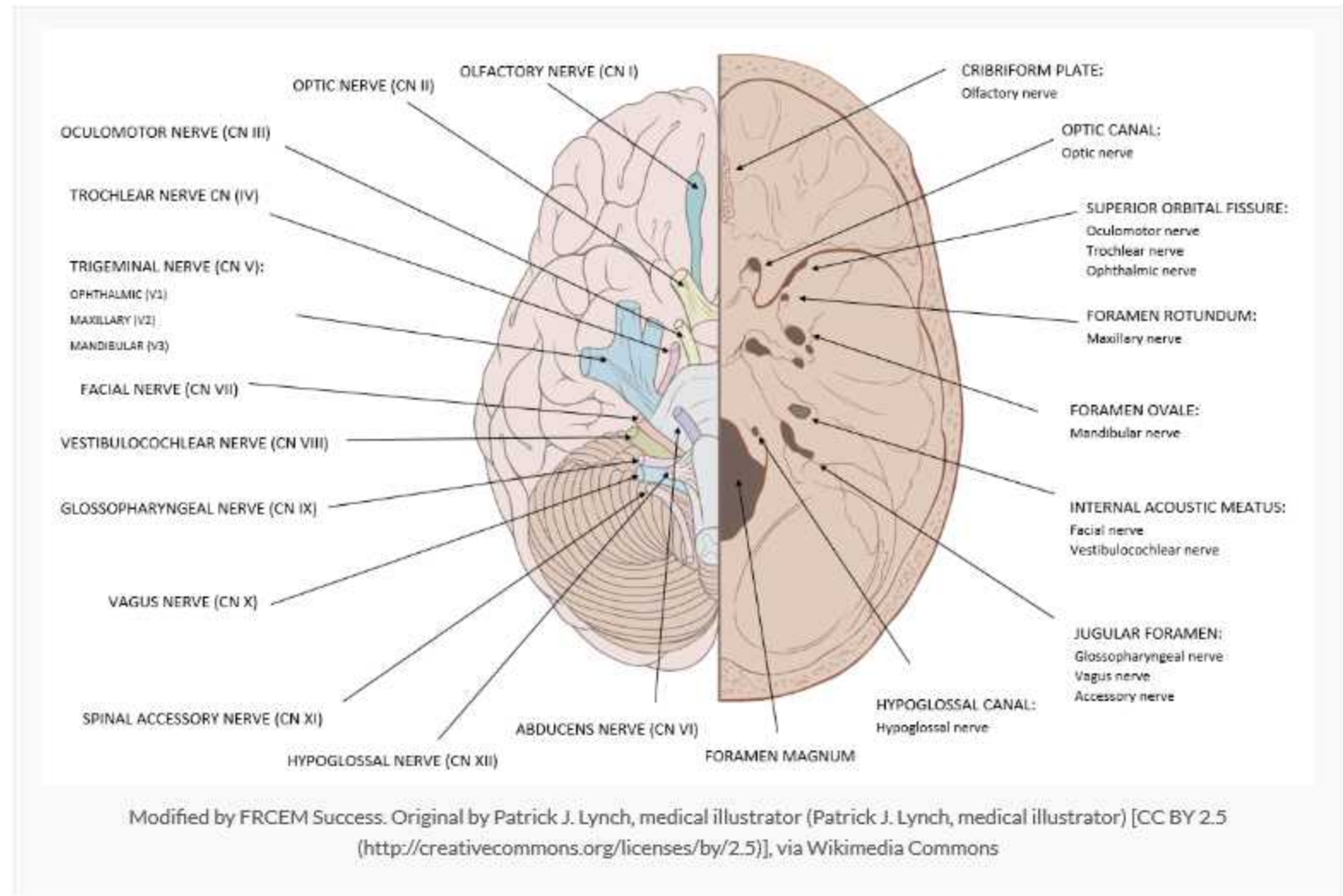
Damage to the hypoglossal nerve results in weakness of the tongue, with deviation of the tongue towards the weak side on protrusion.

Notes

Cranial nerve	Hypoglossal nerve (CN XII)
Key anatomy	Arises from medulla, exits skull through hypoglossal canal
Function	Motor: all intrinsic and extrinsic muscles of tongue (except for palatoglossus)
Assessment	Power and symmetry of tongue, tongue protrusion to look for deviation
Clinical effects of injury	Hemiparalysis of tongue with wasting and fasciculations, tongue deviation towards weak side
Causes of injury	Penetrating trauma, tumours, meningitis, extension of middle ear infection

Key anatomy

The hypoglossal nerve (CN XII) arises from the medulla and passes laterally across the posterior cranial fossa within the subarachnoid space before emerging from the cranial cavity via the hypoglossal canal. It then passes inferiorly to the angle of the mandible and moves in an anterior direction to enter the tongue.



Function

It innervates the hypoglossus, the genioglossus, the styloglossus and all of the intrinsic muscles of the tongue (i.e. all the muscles of the tongue except for the extrinsic palatoglossus muscle innervated by the vagus nerve).

Assessment

The hypoglossal nerve is assessed by asking the patient to protrude their tongue to look for deviation and testing power of the tongue by asking the patient to push their tongue against their cheek.

Clinical implications

In CN XII palsy there is hemiparalysis of the tongue associated with muscle wasting and fasciculations. The tongue deviates towards the weak side upon protrusion due to the unopposed action of the opposite genioglossus.

Isolated hypoglossal nerve injury is relatively uncommon. Possible causes include penetrating traumatic injuries, tumours (e.g. metastases, neurofibroma, cerebellopontine angle lesions), meningitis and infection from the middle ear spreading into the posterior fossa.

Question Navigator

49	Answered
50	Answered
51	Current Question
52	...
53	...
54	...
55	...
56	...
57	...
58	...
59	...
60	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 52 of 142



The maxillary nerve supplies general sensation to all of the following regions EXCEPT for the:

- ☐ a Mucosa of the hard palate
- ☐ b Soft palate
- ☐ c Upper teeth and associated gingiva
- ☐ d External ear
- ☐ e Skin over the temple

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 49 Answered
- 50 Answered
- 51 Answered
- 52 Current Question
- 53 ...
- 54 ...
- 55 ...
- 56 ...
- 57 ...
- 58 ...
- 59 ...
- 60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 52 of 142

The maxillary nerve supplies general sensation to all of the following regions EXCEPT for the:

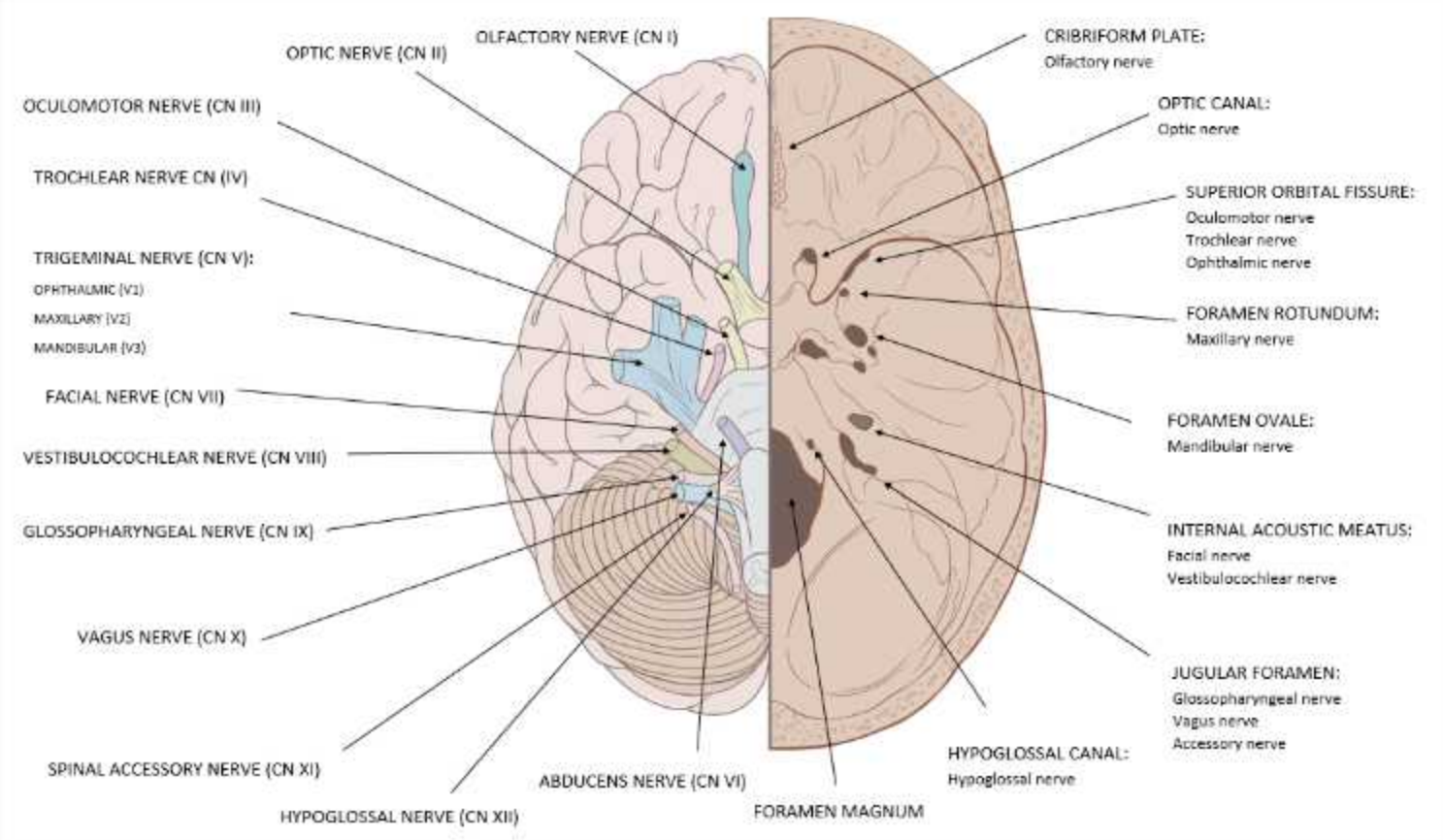
- a) Mucosa of the hard palate
- b) Soft palate
- c) Upper teeth and associated gingiva
- d) External ear
- e) Skin over the temple

Answer

The maxillary nerve does not supply skin over the external ear.

Notes

The maxillary nerve is purely sensory. It originates from the trigeminal ganglia in the cranial cavity and enters the pterygopalatine fossa through the foramen rotundum.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

The maxillary nerve (via its branches) supplies sensation to:

- the orbital wall
- the sphenoidal and ethmoidal sinuses
- the mucosa and glands of the hard palate and associated gingiva
- the nasal cavity
- the soft palate
- the upper teeth and associated gingiva
- the nasopharynx
- skin over the temple and the zygomatic bone
- the maxillary sinus
- the lateral aspect of the external nose and part of the nasal septum
- skin of the lower eyelid and its conjunctiva
- skin over the cheek and upper lip and associated oral mucosa
- part of the cranial dura mater.

It also supplies parasympathetic fibres to the lacrimal glands and nasal glands.

By Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5], via Wikimedia Commons

Question Navigator

49	Answered
50	Answered
51	Answered
52	Current Question
53	...
54	...
55	...
56	...
57	...
58	...
59	...
60	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 53 of 142



The blood supply to the occipital lobe is primarily supplied from which of the following arteries:

- ☐ a Anterior cerebral artery
- ☐ b Middle cerebral artery
- ☐ c Posterior cerebral artery
- ☐ d Basilar artery
- ☐ e Vertebral artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

49 Answered

50 Answered

51 Answered

52 Answered

53 Current Question

54 ...

55 ...

56 ...

57 ...

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 53 of 142

The blood supply to the occipital lobe is primarily supplied from which of the following arteries:

- a) Anterior cerebral artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Basilar artery
- e) Vertebral artery

Answer

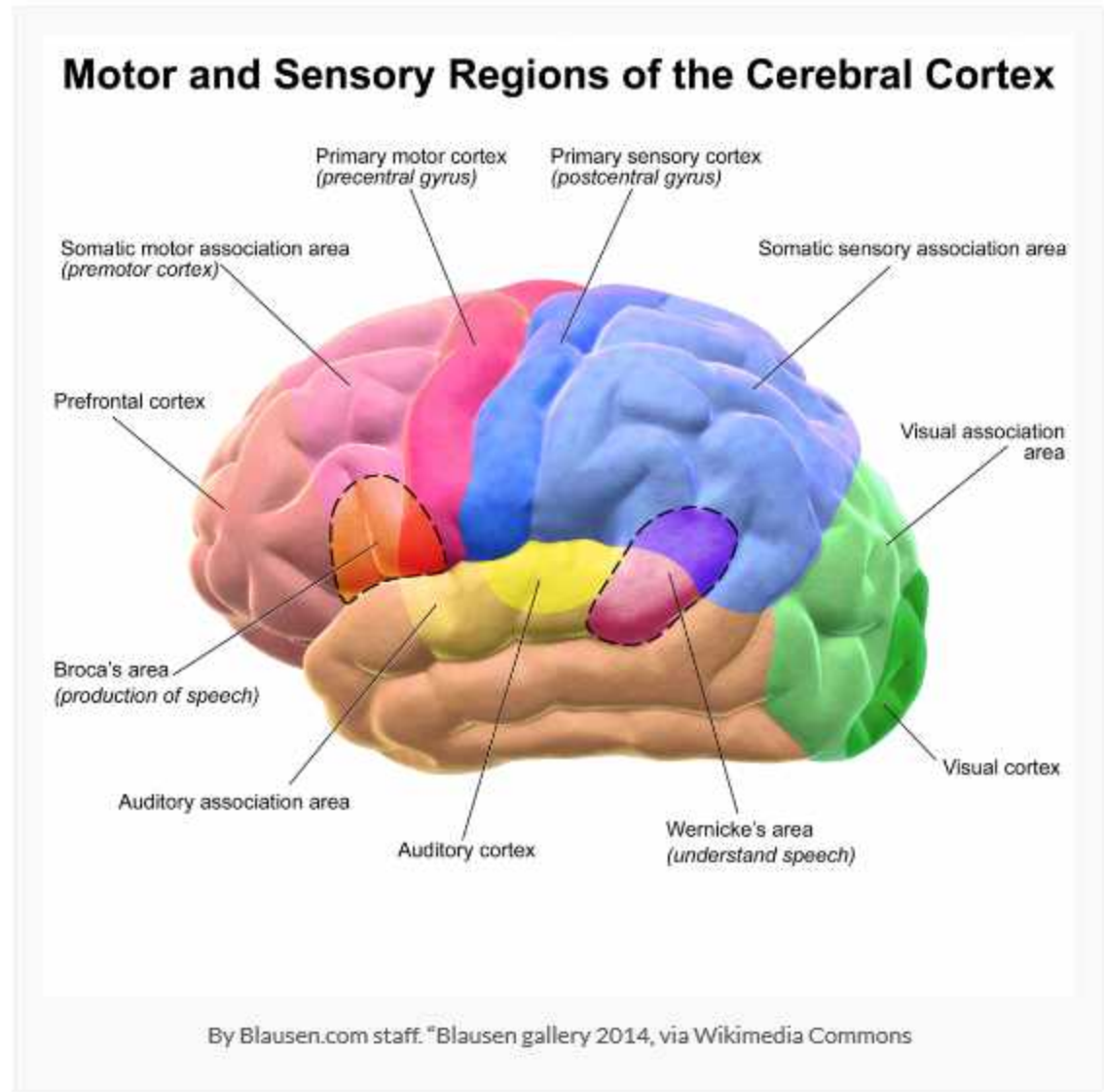
The blood supply to the occipital lobe is from the posterior cerebral artery, but the occipital poles, serving macular vision, have additional supply from a branch of the middle cerebral artery.

Notes

The occipital lobe rests inferiorly upon the tentorium cerebelli which segregates the cerebrum from the cerebellum. The parieto-occipital sulcus separates the occipital lobe from the parietal and temporal lobes anteriorly.

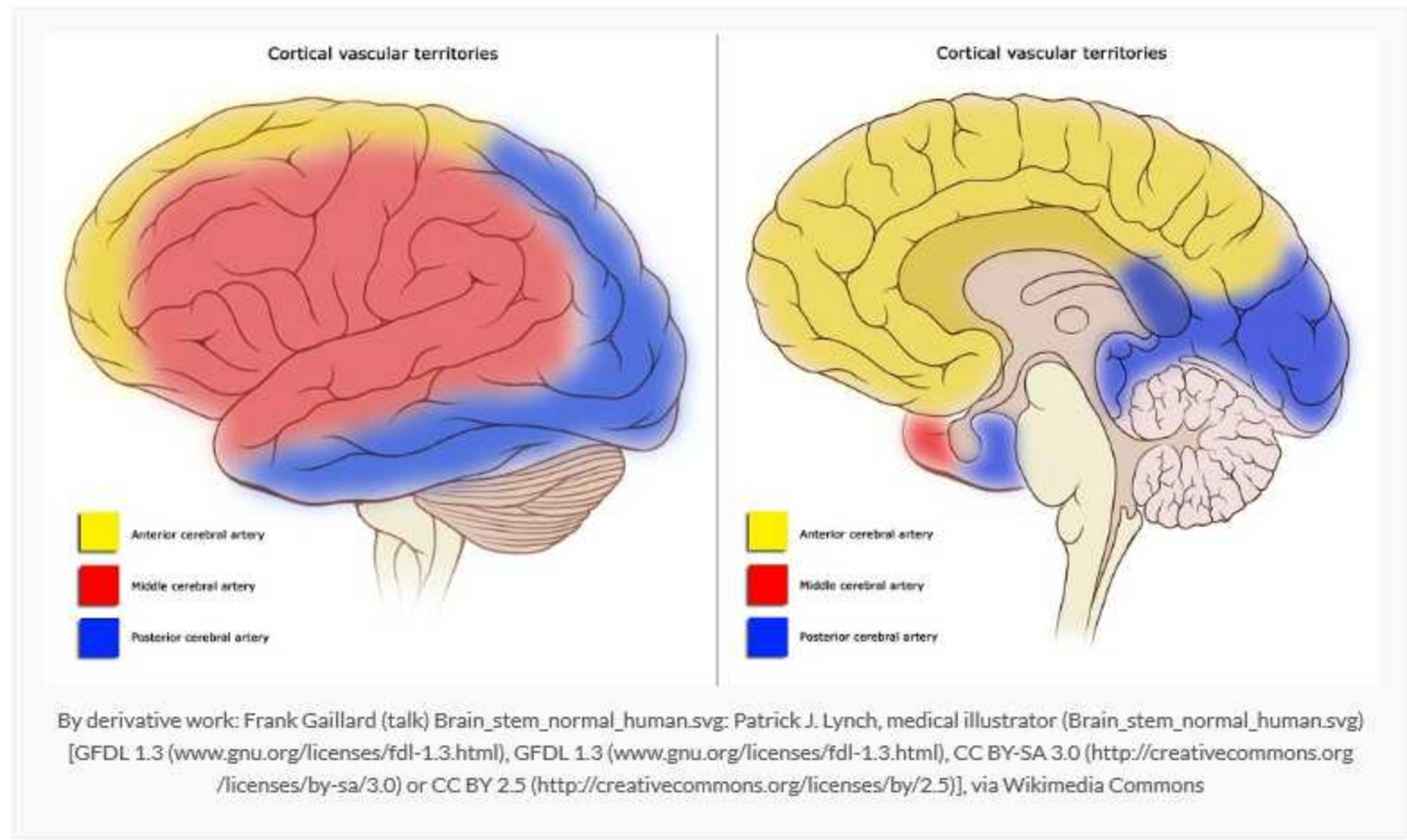
Areas of the occipital lobe

The primary visual cortex is located within the occipital lobe and together with the visual association cortex is responsible for vision.



Blood supply

The blood supply to the occipital lobe is from the posterior cerebral artery, but the occipital poles, serving macular vision, have additional supply from a branch of the middle cerebral artery.



Clinical implications

Damage to the occipital lobe can result in:

- Contralateral homonymous hemianopia (with macular sparing)
- Cortical blindness
- Visual agnosia
- Colour blindness
- Visual illusions or hallucinations
- Difficulty reading and writing

Question Navigator	
49	Answered
50	Answered
51	Answered
52	Answered
53	Current Question
54	...
55	...
56	...
57	...
58	...
59	...
60	...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 54 of 142



Oculomotor (CN III) palsy with sparing of the pupillary reflex is most likely caused by which of the following:

- ☐ a Aneurysm of the posterior communicating artery
- ☐ b Brainstem metastases
- ☐ c Diabetes mellitus
- ☐ d Cavernous sinus disease
- ☐ e Subdural haematoma

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 49 Answered
- 50 Answered
- 51 Answered
- 52 Answered
- 53 Answered
- 54 Current Question
- 55 ...
- 56 ...
- 57 ...
- 58 ...
- 59 ...
- 60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 54 of 142



Oculomotor (CN III) palsy with sparing of the pupillary reflex is most likely caused by which of the following:

- a) Aneurysm of the posterior communicating artery
- b) Brainstem metastases
- c) Diabetes mellitus ✔
- d) **Cavernous sinus disease** ✘
- e) Subdural haematoma

Answer

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

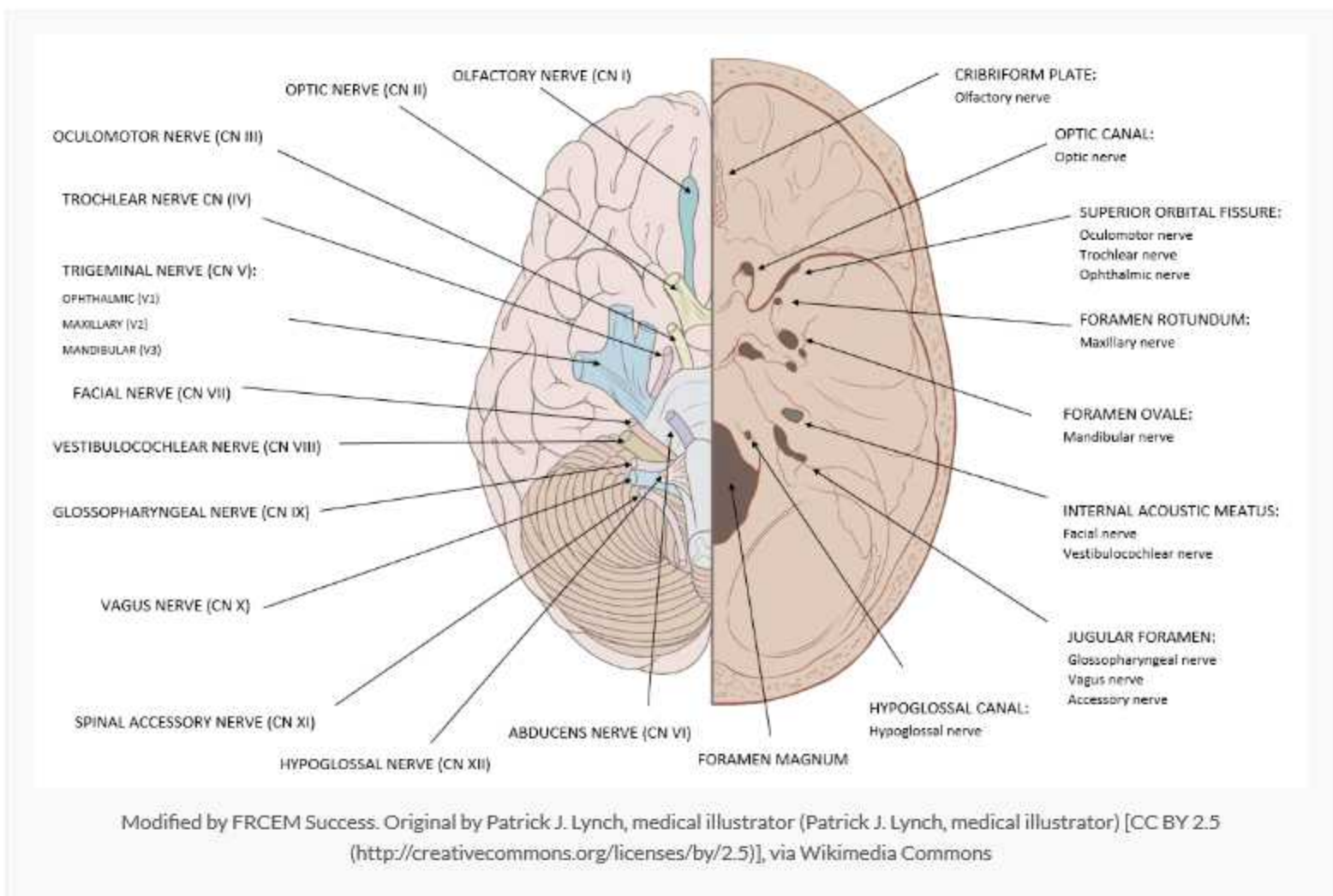
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

[< Previous](#)
[Next >](#)
[Something wrong?](#)

Question Navigator

49	Answered
50	Answered
51	Answered
52	Answered
53	Answered
54	Current Question
55	...
56	...
57	...
58	...
59	...
60	...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 55 of 142



A 54 year old man presents to ED complaining of difficulty chewing. On examination, you note he has loss of muscle bulk over the masseter muscle and loss of power opening the jaw. He also has loss of tactile sensation involving the anterior two-thirds of the tongue. Which of the following cranial nerves is most likely affected:

- ☐ a Facial nerve
- ☐ b Chorda tympani nerve
- ☐ c Glossopharyngeal nerve
- ☐ d Mandibular nerve
- ☐ e Maxillary nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 49 Answered
- 50 Answered
- 51 Answered
- 52 Answered
- 53 Answered
- 54 Answered
- 55 Current Question
- 56 ...
- 57 ...
- 58 ...
- 59 ...
- 60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 55 of 142



A 54 year old man presents to ED complaining of difficulty chewing. On examination, you note he has loss of muscle bulk over the masseter muscle and loss of power opening the jaw. He also has loss of tactile sensation involving the anterior two-thirds of the tongue. Which of the following cranial nerves is most likely affected:

- a) Facial nerve ❌
- b) Chorda tympani nerve
- c) Glossopharyngeal nerve
- d) Mandibular nerve ✅
- e) Maxillary nerve

Answer

The muscles of mastication are innervated by the mandibular division of the trigeminal nerve, which also supplies tactile sensation to the anterior two-thirds of the tongue. The glossopharyngeal nerve supplies taste and general sensation to the posterior third of the tongue. The chorda tympani branch of the facial nerve supplies taste to the anterior two-thirds of the tongue.

Notes

The trigeminal nerve (CN V) is the largest cranial nerve, originating from three sensory nuclei and one motor nucleus extending from the midbrain to the medulla and exiting the brainstem from the pons.

Cranial nerve	Trigeminal nerve (CN V)
Key anatomy	Arises from several nuclei in the brainstem, exits brainstem from pons
Sensory function	Face, oral and nasal cavities, frontal sinus, external ear, afferent pathway of corneal reflex
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric, parasympathetic fibres to lacrimal and nasal glands
Assessment	Sensation of face, jaw jerk, corneal blink reflex, power/bulk of muscles of mastication
Clinical effects of injury	Flaccid paralysis of muscles of mastication, jaw deviation towards affected side, loss of sensation to face, loss of afferent corneal reflex, loss of jaw jerk
Causes of injury	Trauma, anaesthetic block, tumours, cavernous sinus disease

Function

The trigeminal nerve is a mixed motor and sensory nerve. It has three main divisions:

- V1 ophthalmic
- V2 maxillary
- V3 mandibular

The trigeminal nerve supplies:

- Sensation to the face, mucous membranes of the nasal and oral cavities and frontal sinus, teeth, hard palate, soft palate and deep structures of the head (proprioception from muscles and the TMJ), the dura of the anterior and middle cranial fossa and the external ear
- The afferent pathway for the corneal reflex
- The muscles of mastication (temporalis, masseter, lateral and medial pterygoids)
- The tensor tympani muscle of the middle ear
- The tensor veli palatini muscle of the soft palate
- The mylohyoid and the anterior belly of the digastric muscles
- Parasympathetic fibres to lacrimal and nasal glands

Clinical implications

CNV palsy results in:

- Flaccid paralysis of the muscles of mastication
- Jaw deviation to the paralysed side (due to unopposed action of the opposite lateral pterygoid)
- Loss of sensation over the areas innervated by the three divisions of the trigeminal nerve
- Loss of the corneal reflex (afferent pathway)
- Loss of jaw jerk
- Paralysis of tensor tympani muscle leading to hypoacusis

The trigeminal nerve may be damaged by:

- Fractures of the middle third of the face (V2)
- Trauma to the mandible (V3)
- Anaesthetic block of the inferior alveolar nerve (V3)
- Basal skull fractures
- Tumours e.g. of the maxillary antrum and nasopharynx (V3)
- Cavernous sinus pathology (V1)
- Trigeminal neuralgia (sensory disorder characterised by severe shooting pains usually in the distribution of V2 or V3)

All three branches have bilateral cortical representation so a unilateral central lesion, for example a stroke, does not usually produce a deficit.

Question Navigator

49	Answered
50	Answered
51	Answered
52	Answered
53	Answered
54	Answered
55	Current Question
56	...
57	...
58	...
59	...
60	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 56 of 142



Which of the following clinical features is most suggestive of a lesion of the temporal lobe:

- ☐ a Conjugate eye deviation towards the side of the lesion
- ☐ b Homonymous hemianopia
- ☐ c Expressive dysphasia
- ☐ d Hemispatial neglect
- ☐ e Receptive dysphasia

< Previous

Next >

See Answer

Something wrong?

Question Navigator

49 Answered

50 Answered

51 Answered

52 Answered

53 Answered

54 Answered

55 Answered

56 Current Question

57 ...

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 56 of 142

Which of the following clinical features is most suggestive of a lesion of the temporal lobe:

- a) Conjugate eye deviation towards the side of the lesion
- b) Homonymous hemianopia
- c) Expressive dysphasia
- d) Hemispatial neglect
- e) Receptive dysphasia

Answer

Damage to the Wernicke speech area in the temporal lobe can result in a receptive dysphasia. Hemispatial neglect is most likely to occur in a lesion of the parietal lobe. Homonymous hemianopia is most likely to occur in a lesion of the occipital lobe. Expressive dysphasia is most likely to occur in a lesion of the Broca speech area in the frontal lobe. Conjugate eye deviation towards the side of the lesion is most likely to occur in a lesion of the frontal lobe.

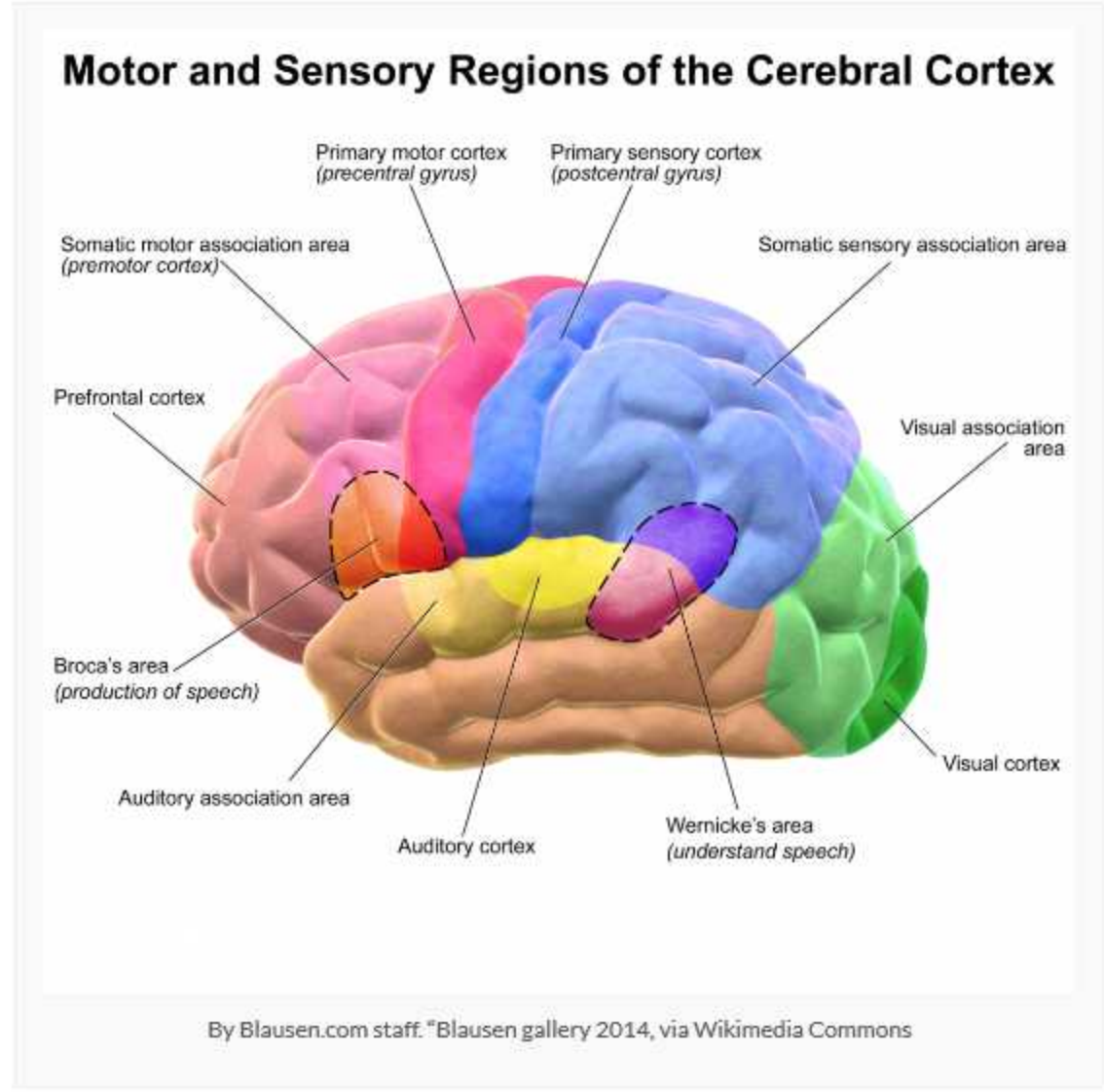
Notes

The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the frontal and parietal lobes, from which it is separated by the lateral sulcus.

Area	Function	Lesion
Wernicke speech area	Language comprehension	Receptive dysphasia
Primary auditory cortex and auditory association area	Perception and recognition of auditory stimuli	Partial cortical deafness, auditory agnosia
Limbic association cortex	Memory, learning, emotion	Memory impairment, increased aggression, difficulty recognising faces/objects
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous superior quadrantanopia

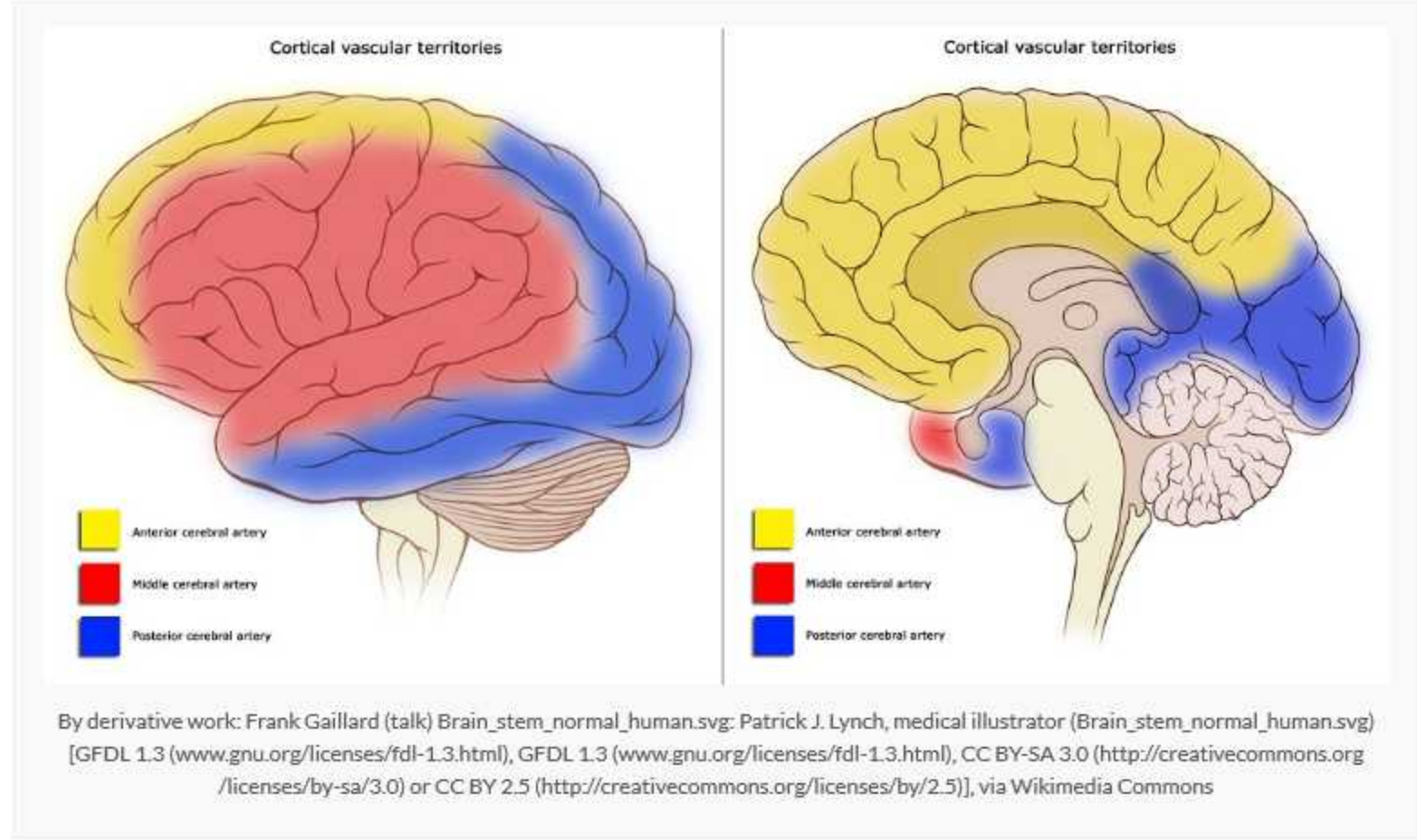
Areas of the temporal lobe

- The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. It is connected to the Broca speech area by the arcuate fasciculus.
- The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.
- The limbic association cortex is important in memory, learning and emotion.
- The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.



Blood supply

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).



Clinical implications

Damage to the temporal lobe may result in:

- Receptive dysphasia – damage to the Wernicke speech area
- Visual field defect (contralateral homonymous superior quadrantanopia) – damage to the optic radiation
- Memory impairment – damage to the limbic system
- Emotional and behavioural disturbances – damage to the limbic system
- Auditory agnosia – damage to the primary auditory cortex or auditory association areas
- Partial cortical deafness (due to bilateral cochlear representation) – damage to the primary auditory cortex

Question Navigator

49	Answered
50	Answered
51	Answered
52	Answered
53	Answered
54	Answered
55	Answered
56	Current Question
57	...
58	...
59	...
60	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 57 of 142



Regarding the optic nerve, which of the following statements is CORRECT:

- ☐ a The optic nerve is surrounded by the cranial meninges.
- ☐ b The optic nerve leaves the orbit through the superior orbital fissure.
- ☐ c The optic nerve has both motor and sensory function.
- ☐ d The optic nerve receives its blood supply primarily from branches of the external carotid artery.
- ☐ e Visual acuity should be tested with Ishihara plates.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

49 Answered

50 Answered

51 Answered

52 Answered

53 Answered

54 Answered

55 Answered

56 Answered

57 Current Question

58 ...

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 57 of 142

Regarding the optic nerve, which of the following statements is CORRECT:

- a) The optic nerve is surrounded by the cranial meninges.
- b) The optic nerve leaves the orbit through the superior orbital fissure.
- c) The optic nerve has both motor and sensory function.
- d) The optic nerve receives its blood supply primarily from branches of the external carotid artery.
- e) Visual acuity should be tested with Ishihara plates.

Answer

The optic disc is surrounded by the cranial meninges as far forwards as the eyeball which provides anatomical rationale for papilloedema seen in raised intracranial pressure. The optic nerve is a purely sensory nerve which leaves the orbit via the optic canal in the sphenoid bone. It receives its blood supply from the anterior cerebral artery, ophthalmic artery and central retinal artery, all branches of the internal carotid artery. Visual acuity is assessed with Snellen charts, Ishihara plates are used to assess colour vision.

Notes

The optic nerve (CN II) is a purely sensory nerve, which carries visual information from the retina to the visual cortex.

Cranial nerve	Optic nerve (CN II)
Key anatomy	Formed from convergence of axons of neurons in ganglion layer of retina, surrounded by cranial meninges, enters skull via optic canal of sphenoid bone, receives blood supply from combination of anterior cerebral, ophthalmic and central retinal arteries
Function	Sensory: vision, afferent pathway of pupillary light reflex
Assessment	Visual acuity (Snellen chart), colour vision (Ishihara plates), pupillary light response, optic disc (fundoscopy), visual fields (tests visual pathway)
Clinical effects of injury	Ipsilateral monocular visual loss, loss of colour vision, abnormal pupillary light reflex, visual field defects if damage to visual pathway
Causes of injury	Optic neuritis in multiple sclerosis, optic nerve compression in orbital cellulitis or glaucoma, optic nerve toxicity, trauma (e.g. orbital fracture, penetrating injury to eye), ischaemia secondary to vascular disease

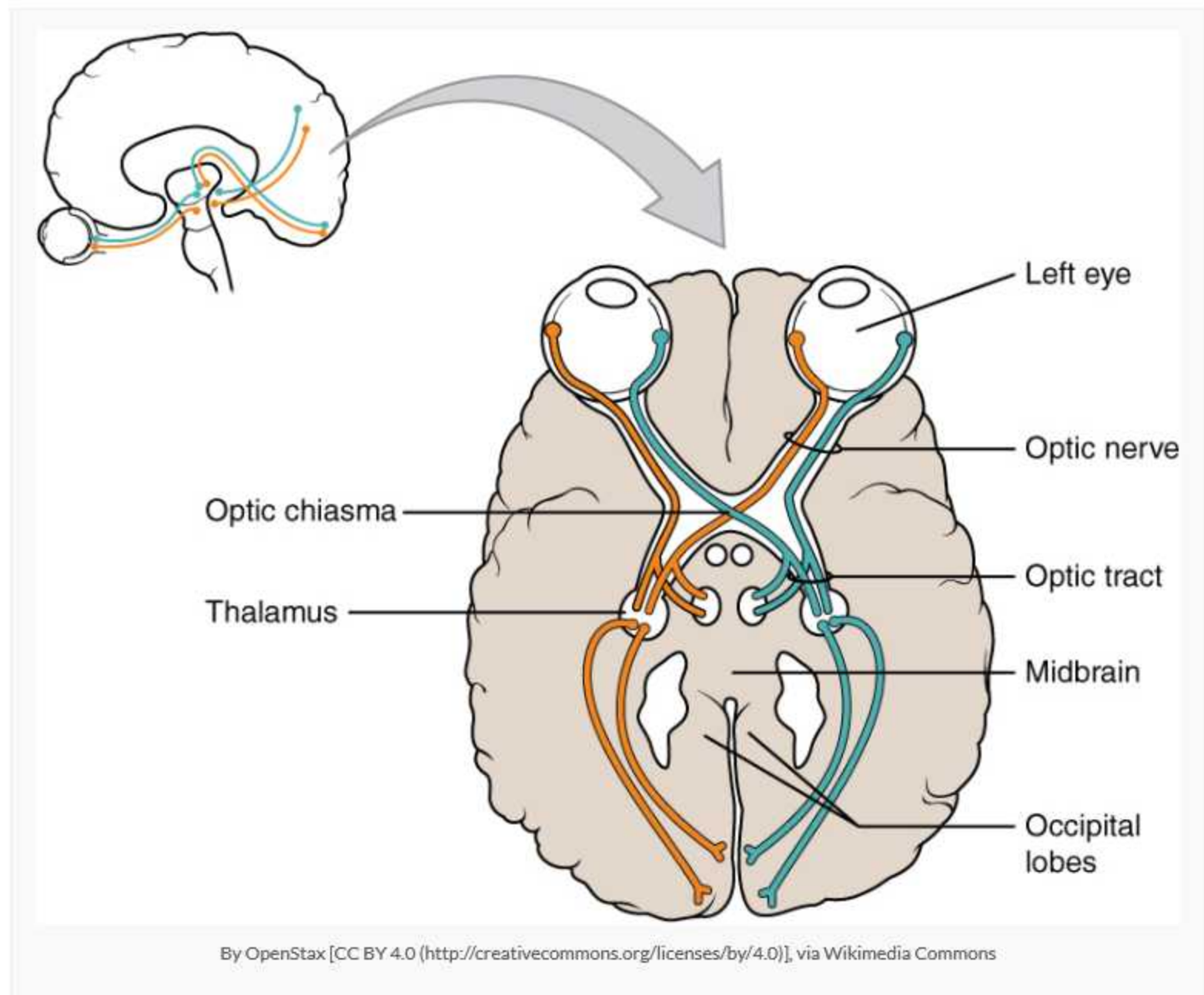
Key anatomy

The optic nerve is not a true cranial nerve but rather an extension of the brain carrying afferent fibres from the retina of the eyeball to the visual centres of the brain. It is one of two cranial nerves that do not arise from the brainstem, the other being the olfactory nerve.

The optic nerve is surrounded by the cranial meninges, including the subarachnoid space, which extend as far forwards as the eyeball. Any increase in intracranial pressure will therefore result in increased pressure in the subarachnoid space surrounding the optic nerve. This impedes venous return along the retinal veins, causing oedema of the optic disc (papilloedema).

The optic nerve leaves the orbit through the sphenoidal optic canal.

The optic nerve receives its blood supply from the anterior cerebral, ophthalmic and central retinal arteries.



Assessment

To assess the optic nerve:

- The patient should be asked if they have any problems with their vision
- Visual acuity should be assessed with a Snellen chart
- Colour vision can be assessed with Ishihara plates
- Pupillary response should be tested using a swinging light to assess direct and consensual reflexes (this tests both the afferent optic nerve and the efferent oculomotor nerve)
- Visual fields should be assessed
- The optic disc should be assessed using fundoscopy

Clinical implications

Lesions of the optic nerve result in:

- Visual loss in the ipsilateral eye
- Loss of colour vision in the ipsilateral eye
- Abnormal pupillary light reflex
 - Loss of pupillary light reflex seen in complete transection of the optic nerve:
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex lost
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex intact
 - Relative afferent pupillary defect (RAPD) seen in other optic nerve disease:
 - Paradoxical direct and consensual dilatation when light is shone in the affected eye directly after being shone in the unaffected eye (the affected eye still senses light and constricts, but to a lesser extent than when light is shone in the unaffected eye, therefore the pupils appear to dilate)

Causes of damage to the optic nerve include:

- Optic neuritis in multiple sclerosis or secondary to measles or mumps
- Optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- Optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- Optic nerve trauma secondary to orbital fracture or penetrating injury to the eye
- Optic nerve ischaemia secondary to arterial disease

Question Navigator

49	Answered
50	Answered
51	Answered
52	Answered
53	Answered
54	Answered
55	Answered
56	Answered
57	Current Question
58	...
59	...
60	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 58 of 142



Regarding the vestibulocochlear nerve, which of the following statements is **INCORRECT**:

- ☐ a The vestibulocochlear nerve emerges from the brainstem at the cerebellopontine angle.
- ☐ b The vestibulocochlear nerve leaves the cranial cavity via the foramen rotundum.
- ☐ c Weber's test distinguishes between sensorineural or conductive hearing loss.
- ☐ d The vestibulocochlear nerve is a purely sensory nerve.
- ☐ e In normal hearing air conduction is louder than bone conduction.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

49 Answered

50 Answered

51 Answered

52 Answered

53 Answered

54 Answered

55 Answered

56 Answered

57 Answered

58 Current Question

59 ...

60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 58 of 142



Regarding the vestibulocochlear nerve, which of the following statements is INCORRECT:

- a) The vestibulocochlear nerve emerges from the brainstem at the cerebellopontine angle.
- b) The vestibulocochlear nerve leaves the cranial cavity via the foramen rotundum. ✓
- c) Weber’s test distinguishes between sensorineural or conductive hearing loss.
- d) The vestibulocochlear nerve is a purely sensory nerve.
- e) In normal hearing air conduction is louder than bone conduction.

Answer

The vestibulocochlear nerve, a purely sensory nerve, leaves the brainstem at the cerebellopontine angle and exits the cranial cavity through the internal acoustic meatus.

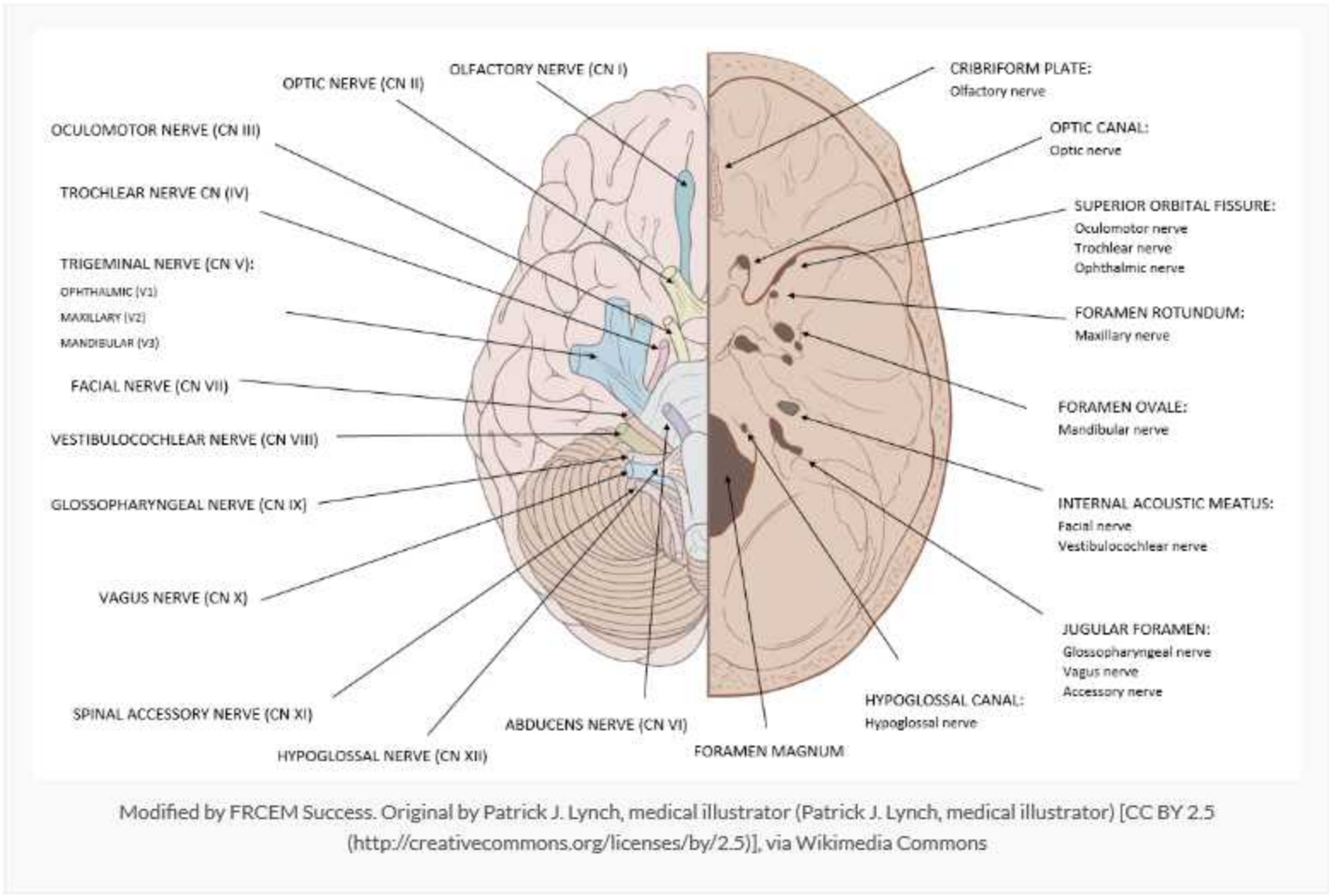
Notes

The vestibulocochlear nerve (CN VIII) is a sensory nerve which transmits sensory information regarding head position and movement via the vestibular nerve, and regarding the reception of sound via the cochlear nerve.

Cranial nerve	Vestibulocochlear nerve (CN VIII)
Key anatomy	Comprised of vestibular and cochlear components which combine in the pons, emerges from the brainstem at the cerebellopontine angle, enters internal acoustic meatus of temporal bone
Function	Sensory; hearing and balance
Assessment	Hearing, Weber and Rinne tests
Clinical effects of injury	Sensorineural deafness, tinnitus, vertigo, loss of equilibrium, nystagmus
Causes of injury	Infection, cerebellopontine angle tumours, basal skull fracture, drugs

Key anatomy

The vestibulocochlear nerve is comprised of two parts. The vestibular and cochlear component combine in the pons to form the vestibulocochlear nerve which emerges from the brainstem at the cerebellopontine angle to enter the internal acoustic meatus of the temporal bone. Within the distal aspect of the internal acoustic meatus, the vestibulocochlear nerve splits, forming the vestibular nerve innervating the vestibular system and the cochlear nerve innervating the cochlear.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Assessment

Hearing should be assessed grossly by whispering numbers and asking the patient to repeat it and by performing Rinne and Weber tests which aim to differentiate between conductive and sensorineural hearing loss. N.B. (AC = air conduction, BC = bone conduction)

Hearing Tests	Weber’s test	Rinne’s test
Screening test	Tests for and distinguishes between conductive and sensorineural deafness in unilateral hearing loss. 512 Hz tuning fork is placed in the middle of the forehead. The patient is asked to report in which ear the sound is heard loudest.	Assesses for the presence of conductive hearing loss in each ear. 512 Hz tuning fork is placed initially on the mastoid process behind each ear until sound is no longer heard (BC), and then placed immediately just outside the ear (AC) with the patient asked to report when the sound is no longer heard.
Normal hearing	Normally sound is heard equally in both ears.	Normally, AC time is longer and louder than BC (AC > BC, Rinne positive).
Unilateral conductive deafness	Sound lateralises to the affected ear.	In the affected ear BC > AC (Rinne negative).
Unilateral sensorineural deafness	Sound lateralises to the normal ear.	In the affected ear AC > BC (Rinne positive).

Clinical implications

Damage to the vestibulocochlear nerve results in (ipsilateral):

- Sensorineural deafness
- Tinnitus
- Loss of equilibrium
- Nystagmus
- Vertigo

Possible causes of damage to the vestibulocochlear nerve include:

- Infections e.g. vestibular neuritis, mastoiditis and herpes zoster
- Cerebellopontine angle tumours (85% are acoustic neuromas, others include meningiomas, cholesteatomas and primary malignancies of the posterior fossa)
- Tumours invading the temporal bone e.g. brainstem glioma
- Vascular malformations at the cerebellopontine angle
- Drugs e.g. aspirin, furosemide, phenytoin, cytotoxics, alcohol
- Paget’s disease
- Fracture of the petrous temporal bone
- Basal skull fracture

< Previous

Next >

Something wrong?

Question Navigator

49	Answered
50	Answered
51	Answered
52	Answered
53	Answered
54	Answered
55	Answered
56	Answered
57	Answered
58	Current Question
59	...
60	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 59 of 142



The oculomotor nerve supplies all of the following structures EXCEPT for the:

- ☐ a Levator palpebrae superioris
- ☐ b Sphincter pupillae
- ☐ c Ciliary muscle
- ☐ d Superior oblique
- ☐ e Inferior oblique

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 49 Answered
- 50 Answered
- 51 Answered
- 52 Answered
- 53 Answered
- 54 Answered
- 55 Answered
- 56 Answered
- 57 Answered
- 58 Answered
- 59 Current Question
- 60 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 59 of 142

The oculomotor nerve supplies all of the following structures EXCEPT for the:

- a) Levator palpebrae superioris
- b) Sphincter pupillae
- c) Ciliary muscle
- d) Superior oblique
- e) Inferior oblique

Answer

The oculomotor nerve supplies four extraocular muscles – the inferior oblique, superior rectus, inferior rectus and medial rectus muscles, the levator palpebrae superioris muscle, the sphincter pupillae muscle and the ciliary muscle. The superior oblique muscle is innervated by the trochlear nerve, and the lateral rectus muscle by the abducens nerve.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

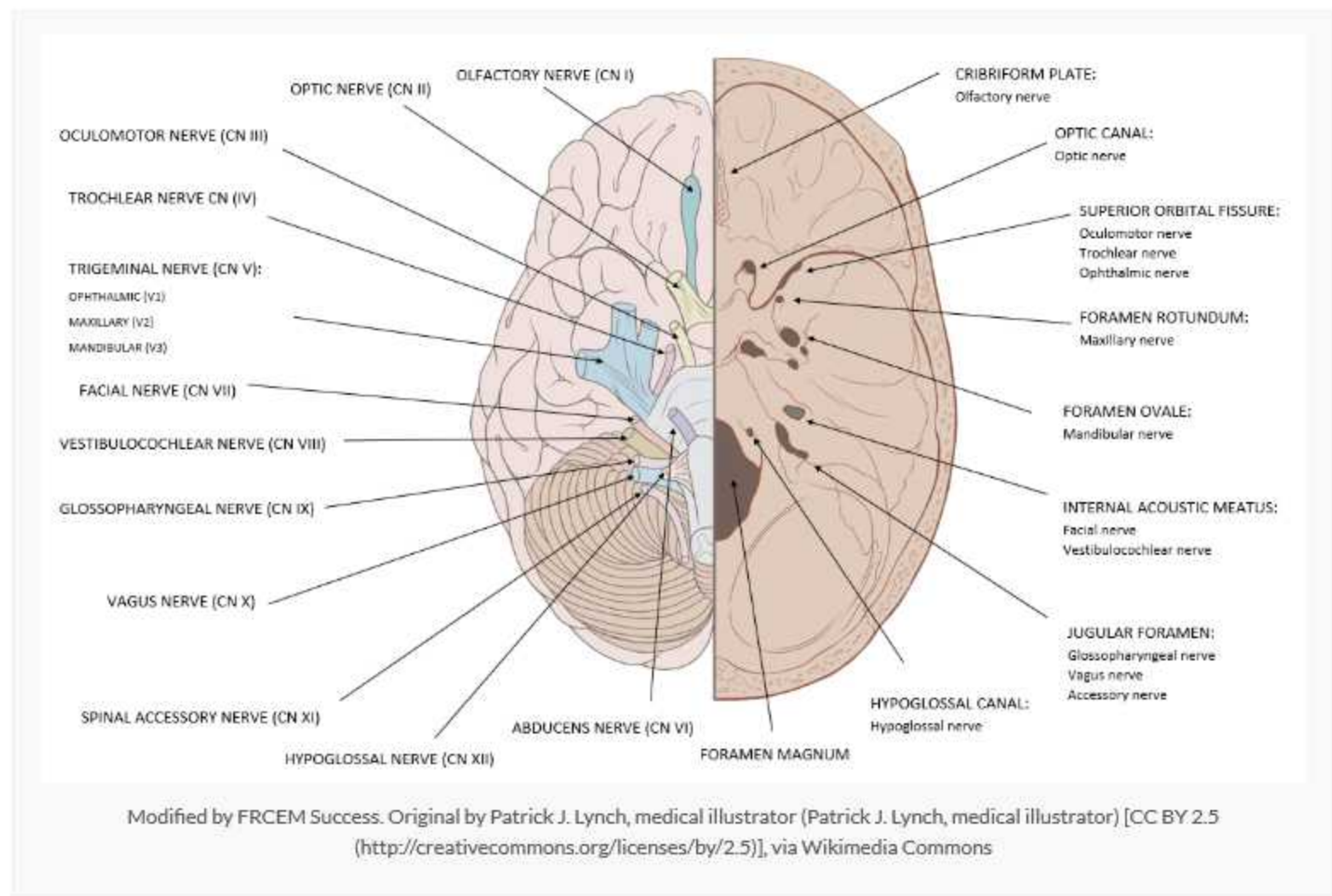
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

49	Answered
50	Answered
51	Answered
52	Answered
53	Answered
54	Answered
55	Answered
56	Answered
57	Answered
58	Answered
59	Current Question
60	...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 60 of 142



A 65 year old lady, with a history of hypertension and diabetes mellitus, presents to ED with a 1 hour history of sudden onset of weakness and numbness solely in her left leg and foot. She is placed on the stroke pathway. Which of the following blood vessels has most likely been occluded:

- ☐ a Middle cerebral artery
- ☐ b Anterior cerebral artery
- ☐ c Posterior cerebral artery
- ☐ d Vertebral artery
- ☐ e Anterior choroidal artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 49 Answered
- 50 Answered
- 51 Answered
- 52 Answered
- 53 Answered
- 54 Answered
- 55 Answered
- 56 Answered
- 57 Answered
- 58 Answered
- 59 Answered
- 60 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 60 of 142



A 65 year old lady , with a history of hypertension and diabetes mellitus, presents to ED with a 1 hour history of sudden onset of weakness and numbness solely in her left leg and foot. She is placed on the stroke pathway. Which of the following blood vessels has most likely been occluded:

- a) Middle cerebral artery
- b) Anterior cerebral artery
- c) Posterior cerebral artery
- d) Vertebral artery
- e) Anterior choroidal artery

Answer

The anterior cerebral artery supplies the medial cerebral hemisphere including the paracentral lobule which is formed from portions of the frontal and parietal lobes, and responsible for the motor and sensory function of the lower limb.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

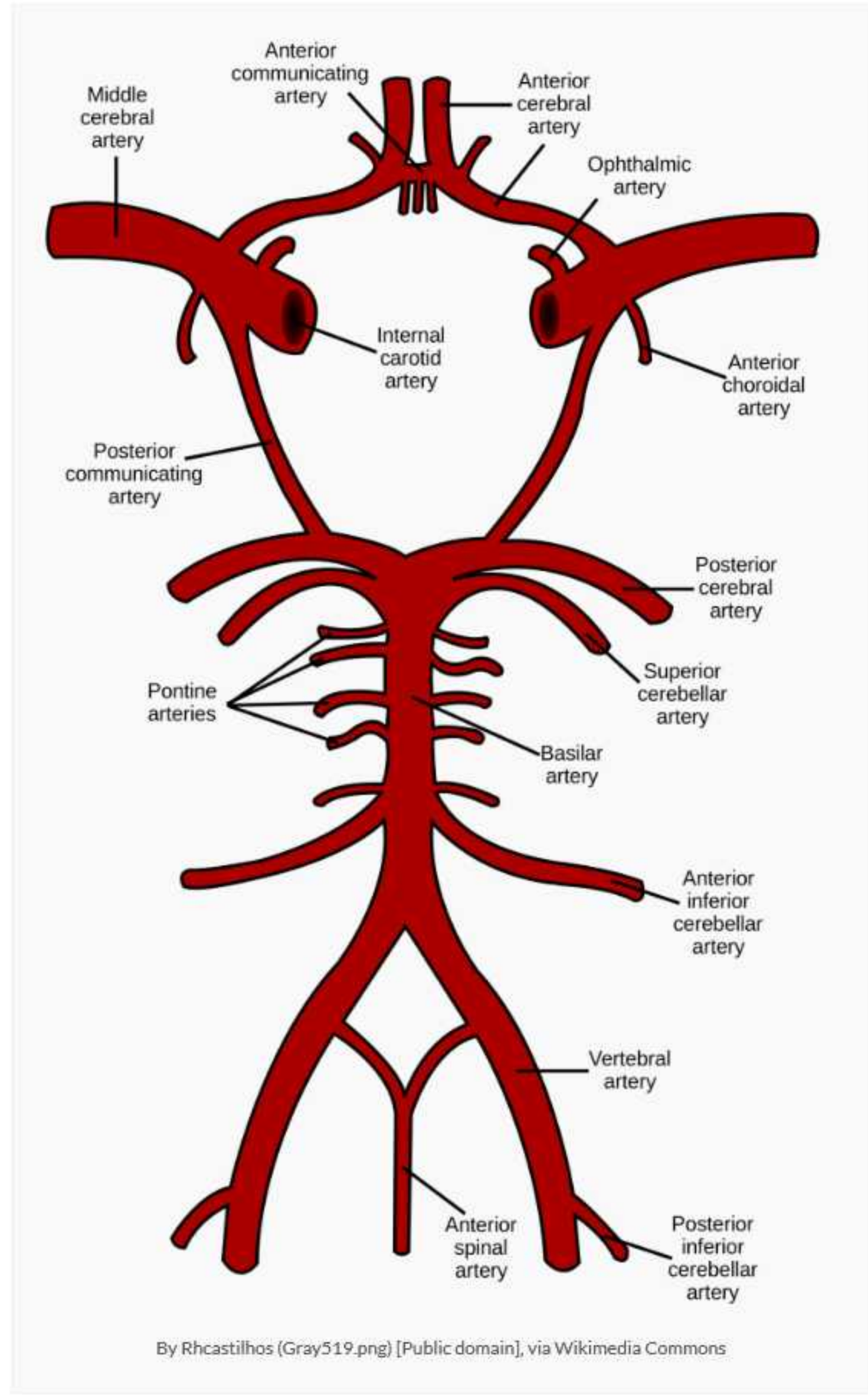
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebral artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

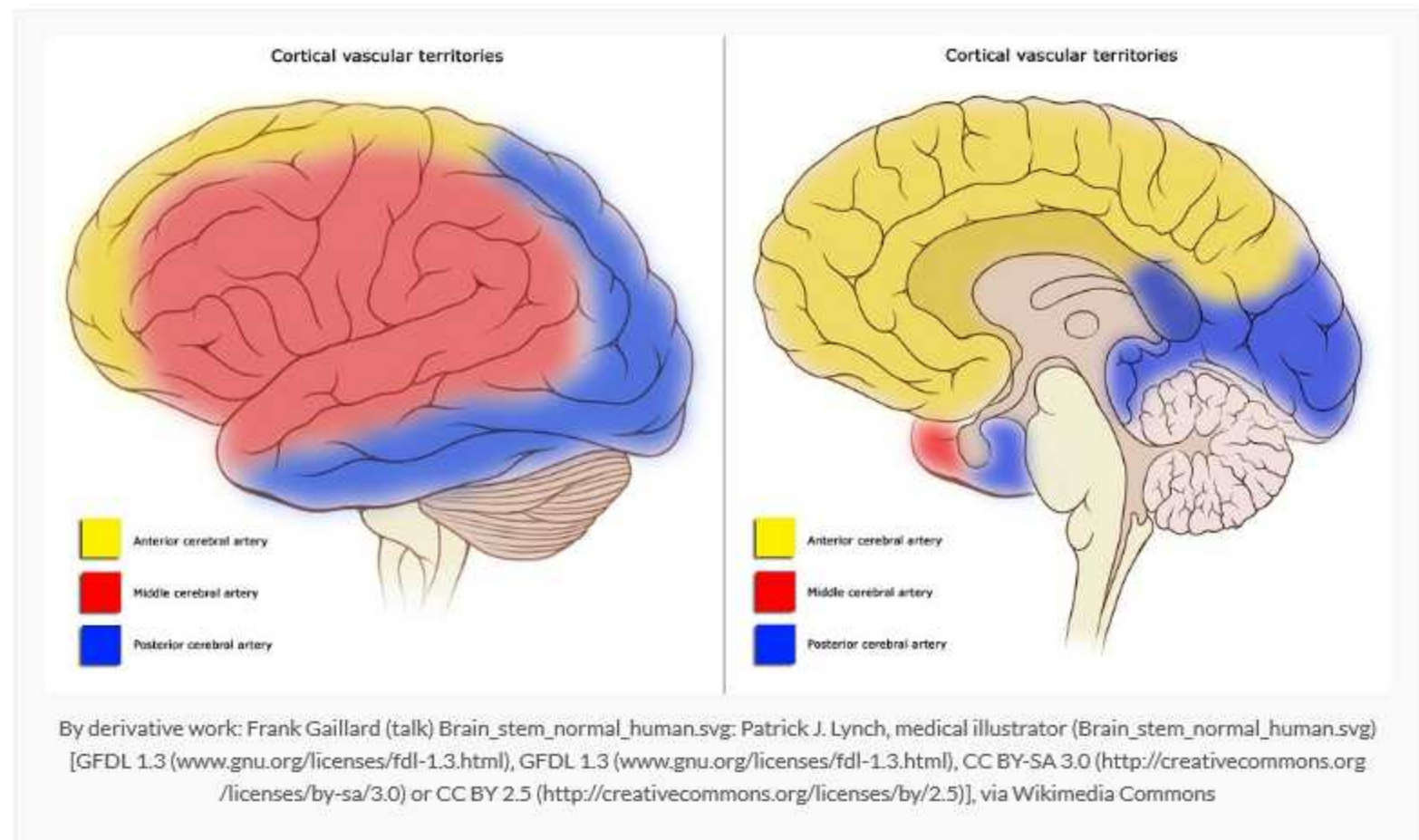
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change• PARIETAL LOBE: contralateral somatosensory loss in the lower limb• CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood• TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia• PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia• N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none">• OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral)• TEMPORAL LOBE: confusion, memory deficit• OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 61 of 142



Regarding the trochlear nerve, which of the following statements is CORRECT:

- ☐ a The trochlear nerve has both sensory and motor function.
- ☐ b The trochlear nerve innervates the superior rectus muscle.
- ☐ c The trochlear nerve has the shortest intracranial course.
- ☐ d The trochlear nerve enters the orbit through the superior orbital fissure.
- ☐ e Trochlear nerve palsy results in loss of eyeball adduction.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

61 [Current Question](#)

62 ...

63 ...

64 ...

65 ...

66 ...

67 ...

68 ...

69 ...

70 ...

71 ...

72 ...

73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 61 of 142

Regarding the trochlear nerve, which of the following statements is CORRECT:

- a) The trochlear nerve has both sensory and motor function.
- b) The trochlear nerve innervates the superior rectus muscle.
- c) The trochlear nerve has the shortest intracranial course.
- d) The trochlear nerve enters the orbit through the superior orbital fissure. ✓
- e) Trochlear nerve palsy results in loss of eyeball adduction.

Answer

The trochlear nerve enters the orbit through the superior orbital fissure. It has the longest intracranial course. It is a purely motor nerve, which innervates the superior oblique muscle responsible for intorsion, depression and abduction of the eye.

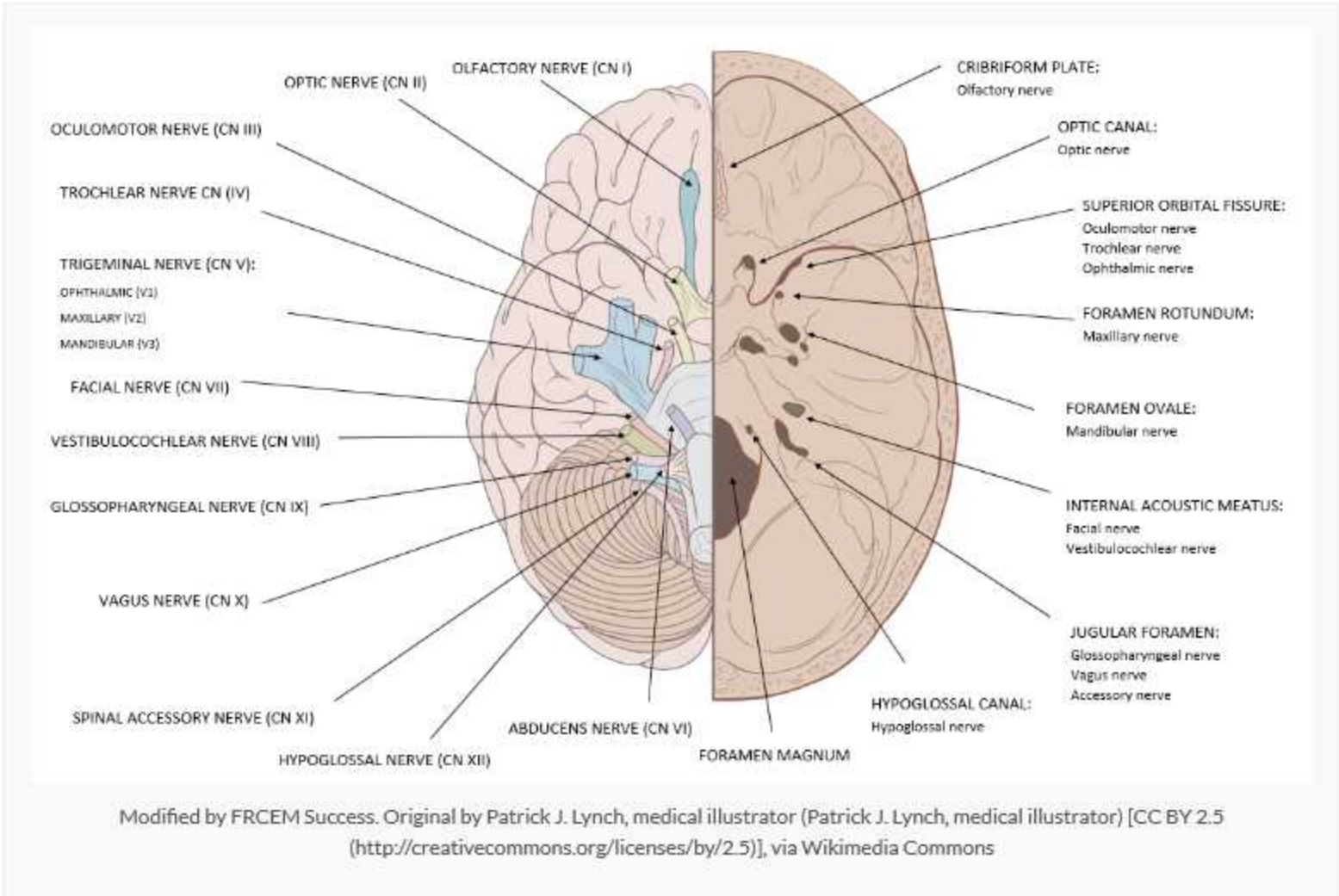
Notes

The trochlear nerve (CN IV) is a motor nerve supplying the superior oblique muscle of the eye.

Cranial nerve	Trochlear nerve (CN IV)
Key anatomy	Arises from midbrain, travels through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: superior oblique muscle of eye (intorsion, depression and abduction of eye)
Assessment	Eye movements
Clinical effects of injury	Weakness of downward gaze (difficulty reading/walking downstairs), vertical diplopia, eye is extorted and may be elevated (patient head tilts to opposite side to compensate)
Causes of injury	Idiopathic, trauma, microvasculopathy, cavernous sinus disease, raised intracranial pressure

Anatomical course

It is the smallest cranial nerve but has the longest cranial course. It arises from the trochlear nucleus and decussates within the midbrain, emerging from the posterior aspect of the midbrain. It runs anteroinferiorly within the subarachnoid space before piercing the dura and travelling along the lateral wall of the cavernous sinus, before entering the orbit of the eye via the superior orbital fissure.



Function

The superior oblique primarily rotates the top of the eye towards the nose (intorsion). Secondly, it moves the eye downward (depression) and outward (abduction). It prevents the unopposed action of the superior rectus which would otherwise rotate the globe.

Clinical implications

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

Causes of damage include:

- Idiopathic (most commonly)
- Trauma
- Microvasculopathy (associated with diabetes and hypertension)
- Multiple sclerosis
- Lesions in the midbrain
- Cavernous sinus disease
- Raised intracranial pressure

Question Navigator

Question	Answer
62	...
63	...
64	...
65	...
66	...
67	...
68	...
69	...
70	...
71	...
72	...
73	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 62 of 142



The corpus callosum is composed of which type of fibres:

- ☐ a Projection fibres
- ☐ b Short association fibres
- ☐ c Commissural fibres
- ☐ d Long association fibres
- ☐ e U-fibres

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

62 Current Question

63 ...

64 ...

65 ...

66 ...

67 ...

68 ...

69 ...

70 ...

71 ...

72 ...

73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 62 of 142



The corpus callosum is composed of which type of fibres:

- a) **Projection fibres** ❌
- b) Short association fibres
- c) Commissural fibres ✅
- d) Long association fibres
- e) U-fibres

Answer

The corpus callosum, composed of commissural fibres, links the cerebral cortex of the left and right cerebral hemisphere.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

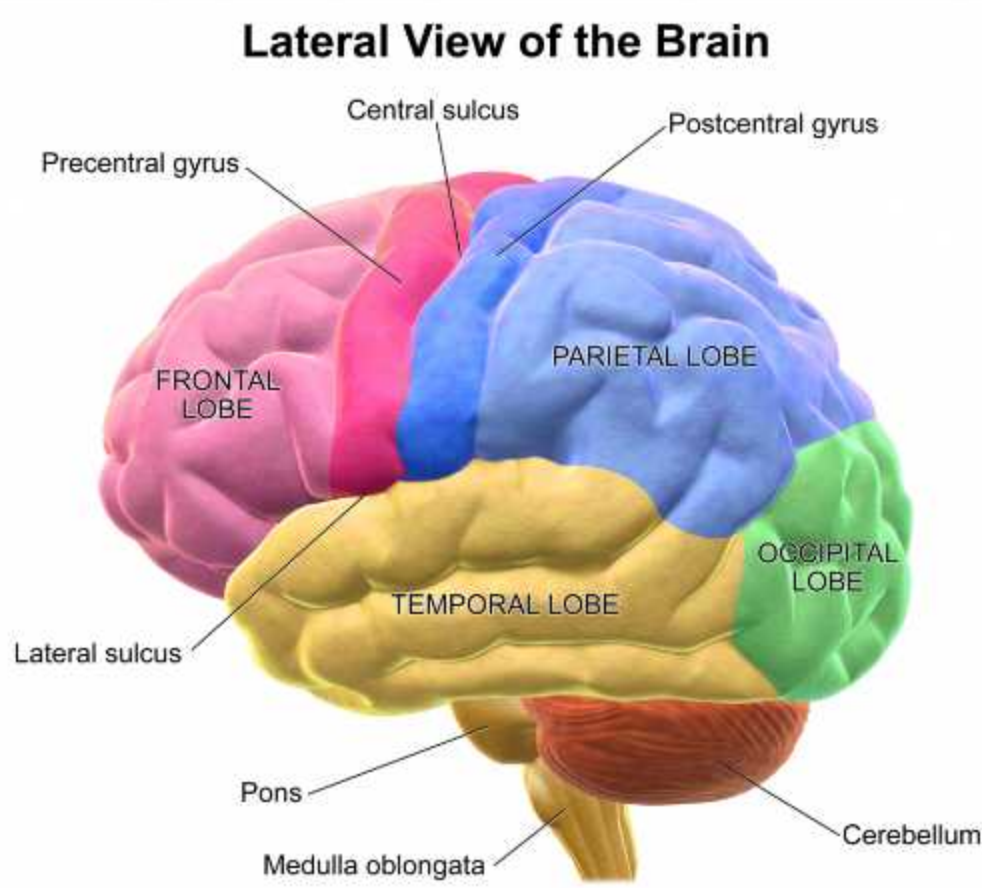
Cerebral cortex

The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

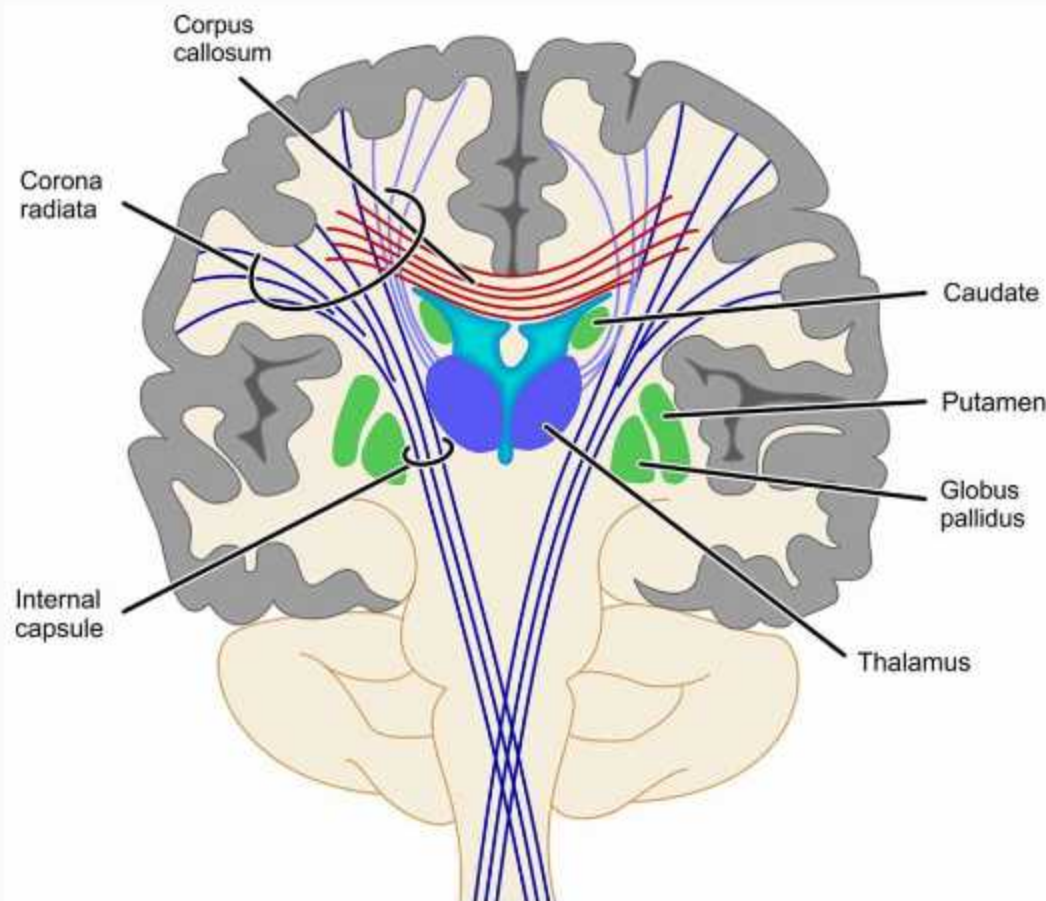
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 63 of 142



The chorda tympani branch of the facial nerve carries which of the following:

- ☐ a Taste from the posterior one-third of the tongue
- ☐ b Sensation from the posterior one-third of the tongue
- ☐ c Parasympathetic innervation of the parotid gland
- ☐ d Taste from the anterior two-thirds of the tongue
- ☐ e Sensation from the anterior two-thirds of the tongue

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Current Question
- 64 ...
- 65 ...
- 66 ...
- 67 ...
- 68 ...
- 69 ...
- 70 ...
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 63 of 142



The chorda tympani branch of the facial nerve carries which of the following:

- a) Taste from the posterior one-third of the tongue
- b) Sensation from the posterior one-third of the tongue
- c) **Parasympathetic innervation of the parotid gland** ✖
- d) Taste from the anterior two-thirds of the tongue ✔
- e) Sensation from the anterior two-thirds of the tongue

Answer

The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The mandibular branch of the trigeminal nerve supplies general sensation to the anterior two-thirds of the tongue. The glossopharyngeal nerve supplies general sensation and taste to the posterior one-third of the tongue.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

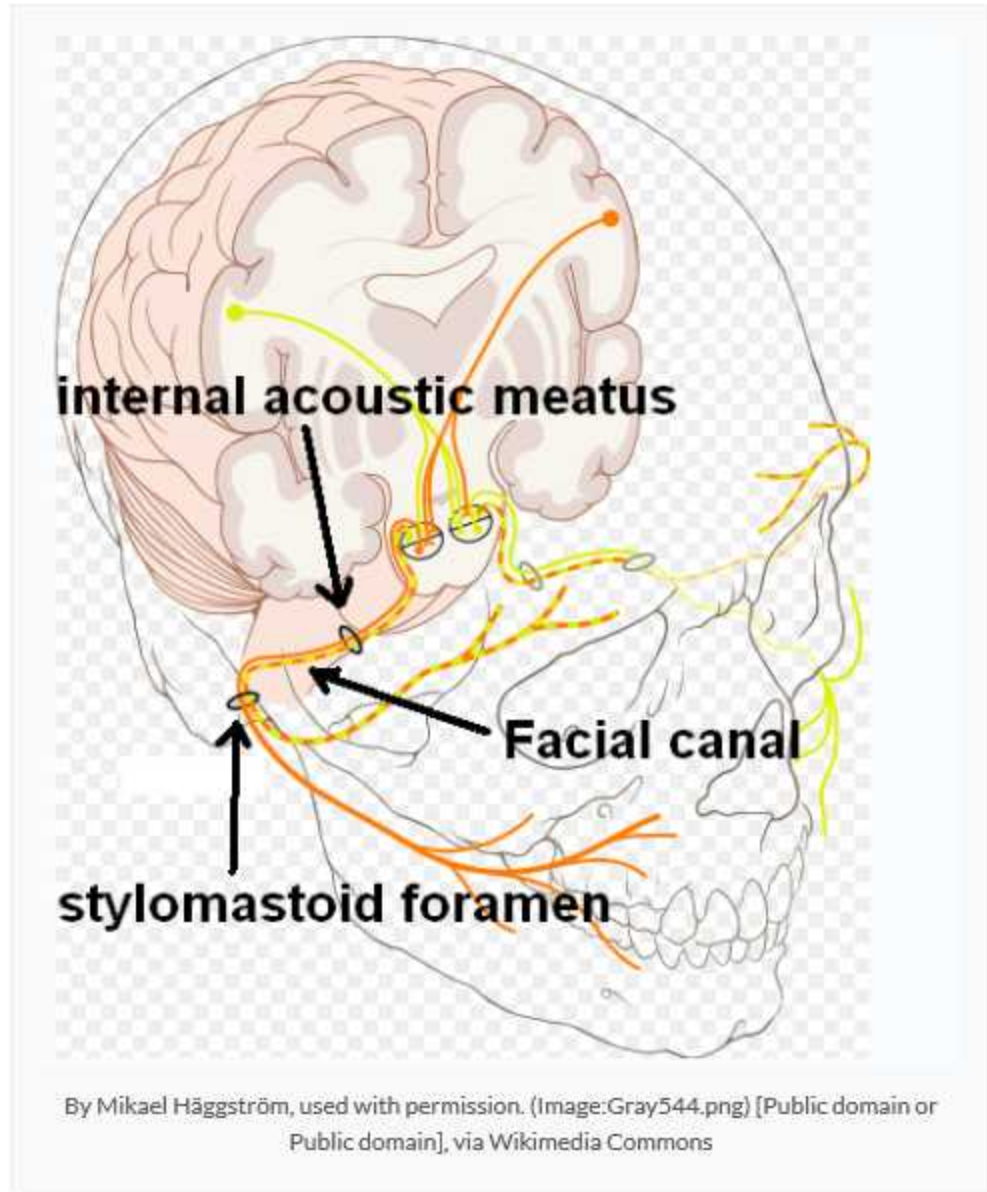
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

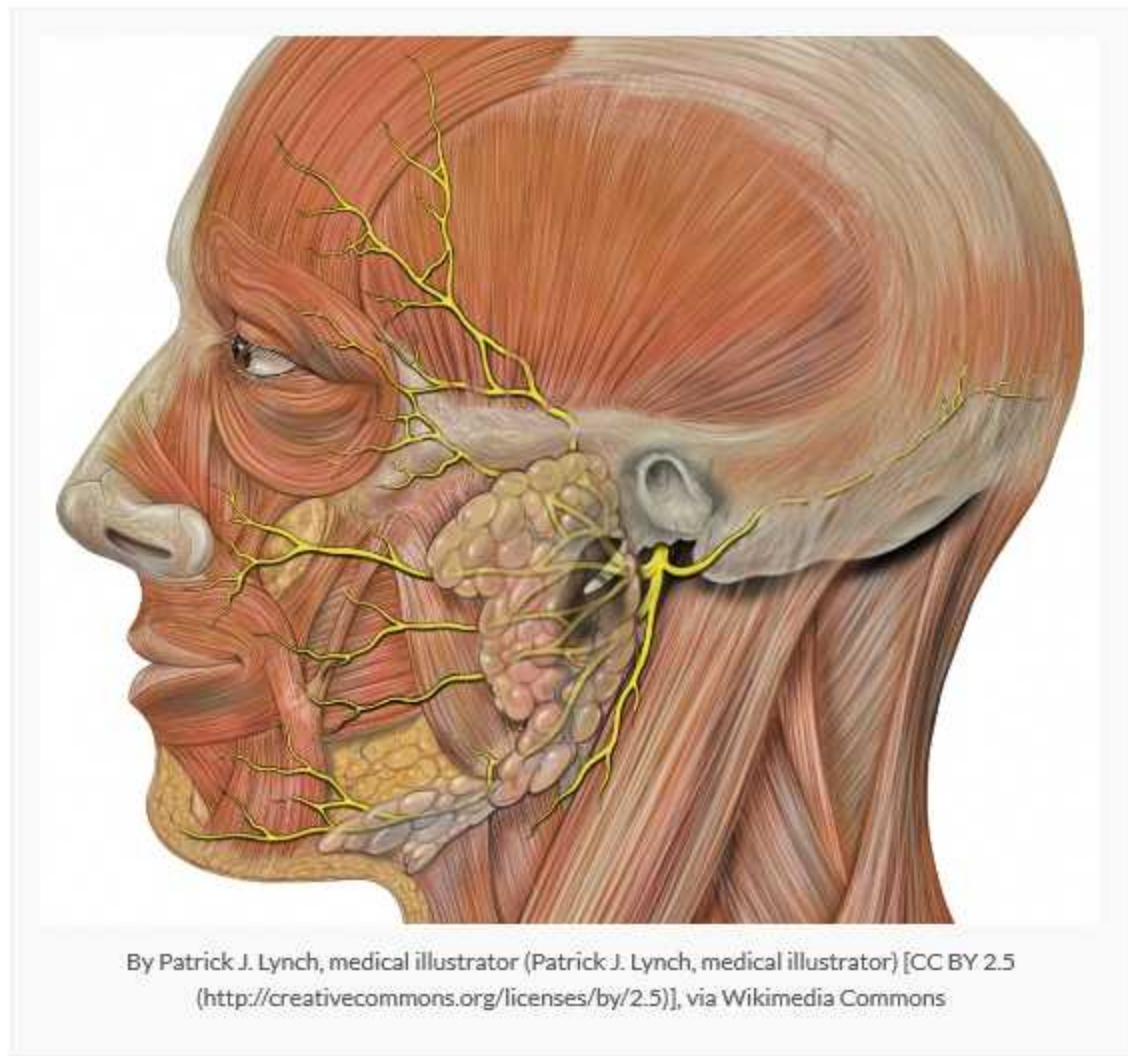
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[< Previous](#)
[Next >](#)

Something wrong?

Question Navigator

62	Answered
63	Current Question
64	...
65	...
66	...
67	...
68	...
69	...
70	...
71	...
72	...
73	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 64 of 142



A 50 year old man presents to ED with diplopia and a ptosis. On pulling his eyelid up, you note that his pupil is looking down and out, and his pupil is fixed and dilated. Further imaging shows that the patient has a cerebral aneurysm compressing a cranial nerve. Which of the following blood vessels is most likely to be the culprit:

- ☐ a Anterior cerebral artery
- ☐ b Middle cerebral artery
- ☒ c Posterior cerebral artery
- ☐ d Anterior communicating artery
- ☐ e Posterior communicating artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

61	Answered
62	Answered
63	Answered
64	Current Question
65	...
66	...
67	...
68	...
69	...
70	...
71	...
72	...
73	...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 64 of 142



A 50 year old man presents to ED with diplopia and a ptosis. On pulling his eyelid up, you note that his pupil is looking down and out, and his pupil is fixed and dilated. Further imaging shows that the patient has a cerebral aneurysm compressing a cranial nerve. Which of the following blood vessels is most likely to be the culprit:

- a) Anterior cerebral artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Anterior communicating artery
- e) Posterior communicating artery

Answer

Ptosis, fixed dilated pupil and eye resting in down and out position are clinical features of a oculomotor (CN III) palsy. The cisternal portion of the oculomotor nerve is in the subarachnoid space anterior to the midbrain and in close proximity to the posterior communicating artery. Posterior communicating artery aneurysm is an important cause of oculomotor palsy.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

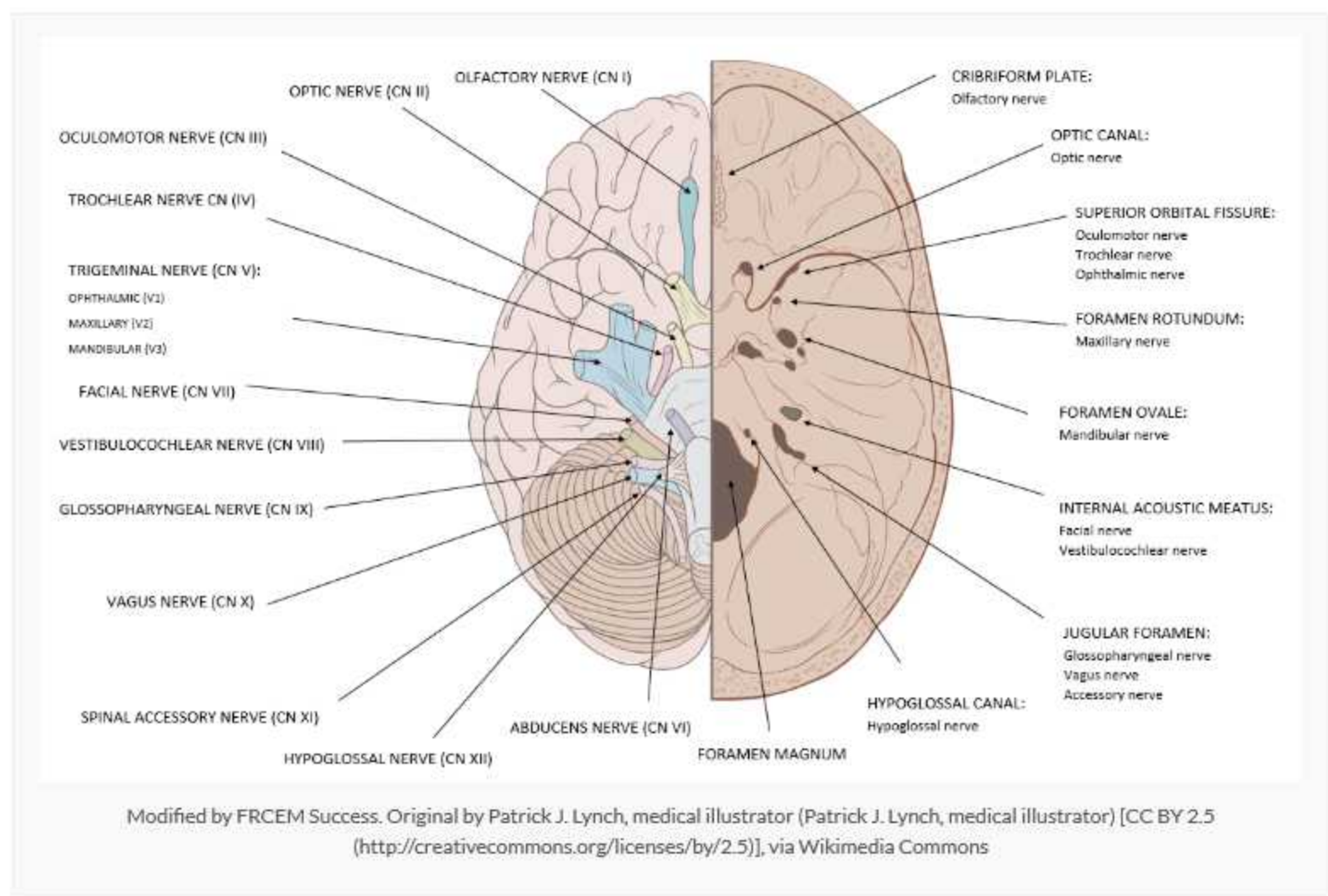
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

62	Answered
63	Answered
64	Current Question
65	...
66	...
67	...
68	...
69	...
70	...
71	...
72	...
73	...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthetastline
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 65 of 142



The thalamus is a wedge-shaped structure surrounding which of the following structures:

- ☐ a Lateral ventricles
- ☐ b Cerebellum
- ☐ c Third ventricle
- ☐ d Fourth ventricle
- ☐ e Pons

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Current Question
- 66 ...
- 67 ...
- 68 ...
- 69 ...
- 70 ...
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 65 of 142

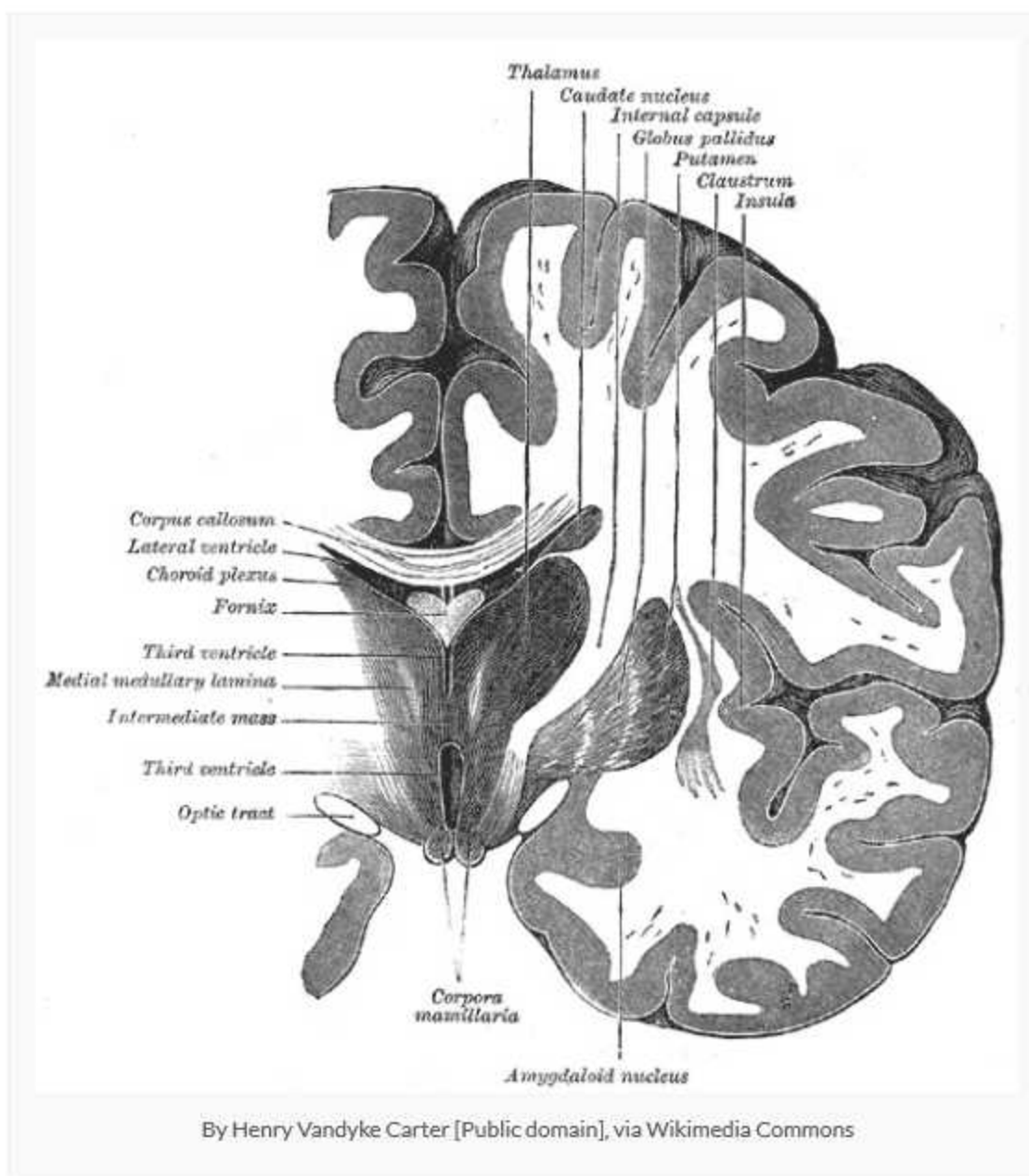


The thalamus is a wedge-shaped structure surrounding which of the following structures:

- a) Lateral ventricles
- b) Cerebellum
- c) **Third ventricle** ✓
- d) Fourth ventricle
- e) Pons

Notes

The thalamus is a wedge-shaped structure around the third ventricle, made up of at least 50 thalamic nuclei.



The thalamus has many functions including:

- translation of prethalamic inputs into readable form
- process and relay of sensory information selectively to various parts of the cerebral cortex
- regulation of sleep and wakefulness
- thalamo-cortico-thalamic circuits involved in consciousness, arousal, level of awareness, and activity

[< Previous](#)

[Next >](#)

[Something wrong?](#)

Question Navigator

61	Answered
62	Answered
63	Answered
64	Answered
65	Current Question
66	...
67	...
68	...
69	...
70	...
71	...
72	...
73	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 66 of 142



The right and left cerebral hemispheres are partially separated by which of the following structures:

- ☐ a Precentral gyrus
- ☐ b Internal capsule
- ☐ c Longitudinal fissure
- ☐ d Central sulcus
- ☐ e Lateral sulcus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Current Question
- 67 ...
- 68 ...
- 69 ...
- 70 ...
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 66 of 142



The right and left cerebral hemispheres are partially separated by which of the following structures:

- a) Precentral gyrus
- b) Internal capsule
- c) **Longitudinal fissure** ✓
- d) Central sulcus
- e) Lateral sulcus

Answer

The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure).

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebral cortex

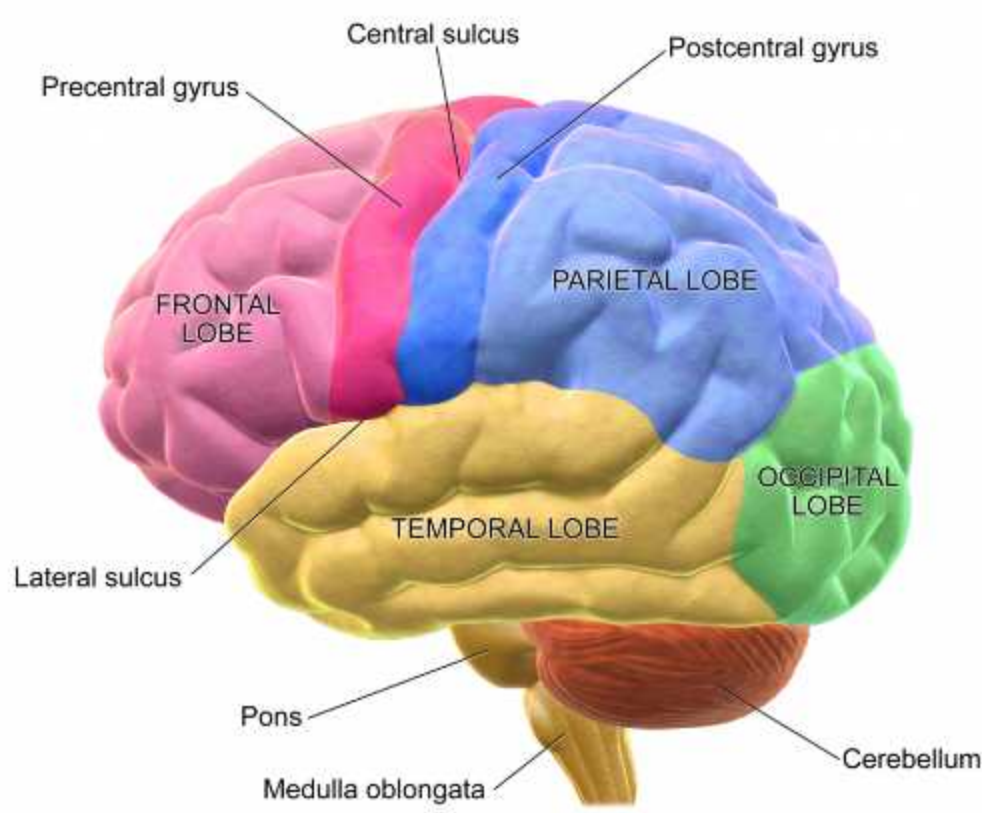
The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus

Lateral View of the Brain



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

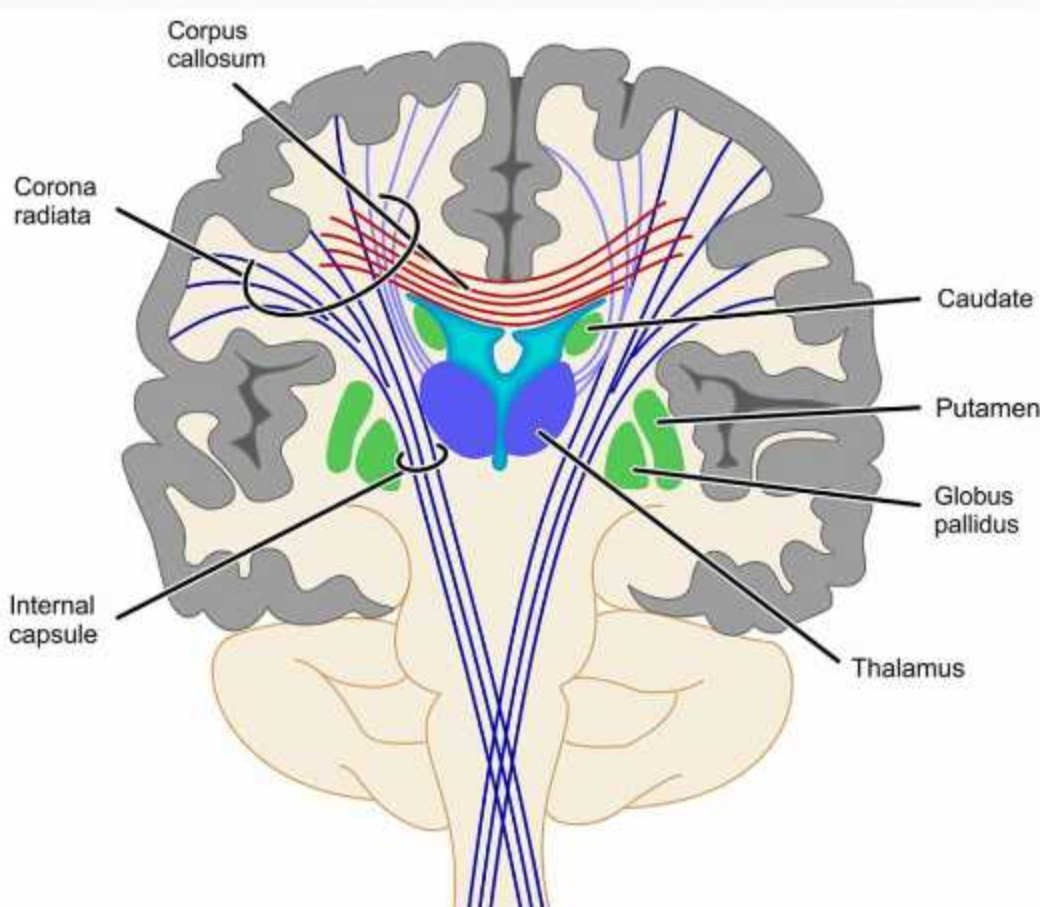
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 67 of 142



Occlusion of which of the following blood vessels is most likely to result in a receptive dysphasia:

- ☐ a Anterior cerebral artery
- ☐ b Anterior communicating artery
- ☐ c Middle cerebral artery
- ☐ d Posterior cerebral artery
- ☐ e Basilar artery

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Current Question
- 68 ...
- 69 ...
- 70 ...
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 67 of 142

Occlusion of which of the following blood vessels is most likely to result in a receptive dysphasia:

- a) Anterior cerebral artery
- b) Anterior communicating artery
- c) Middle cerebral artery
- d) Posterior cerebral artery
- e) Basilar artery

Answer

The middle cerebral artery supplies the lateral convexity of the cerebral hemisphere including a large proportion of the frontal lobe, temporal lobe and parietal lobe. Receptive dysphasia is caused by damage to the Wernicke speech area in the dominant superior temporal lobe which is supplied by the middle cerebral artery.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) - either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

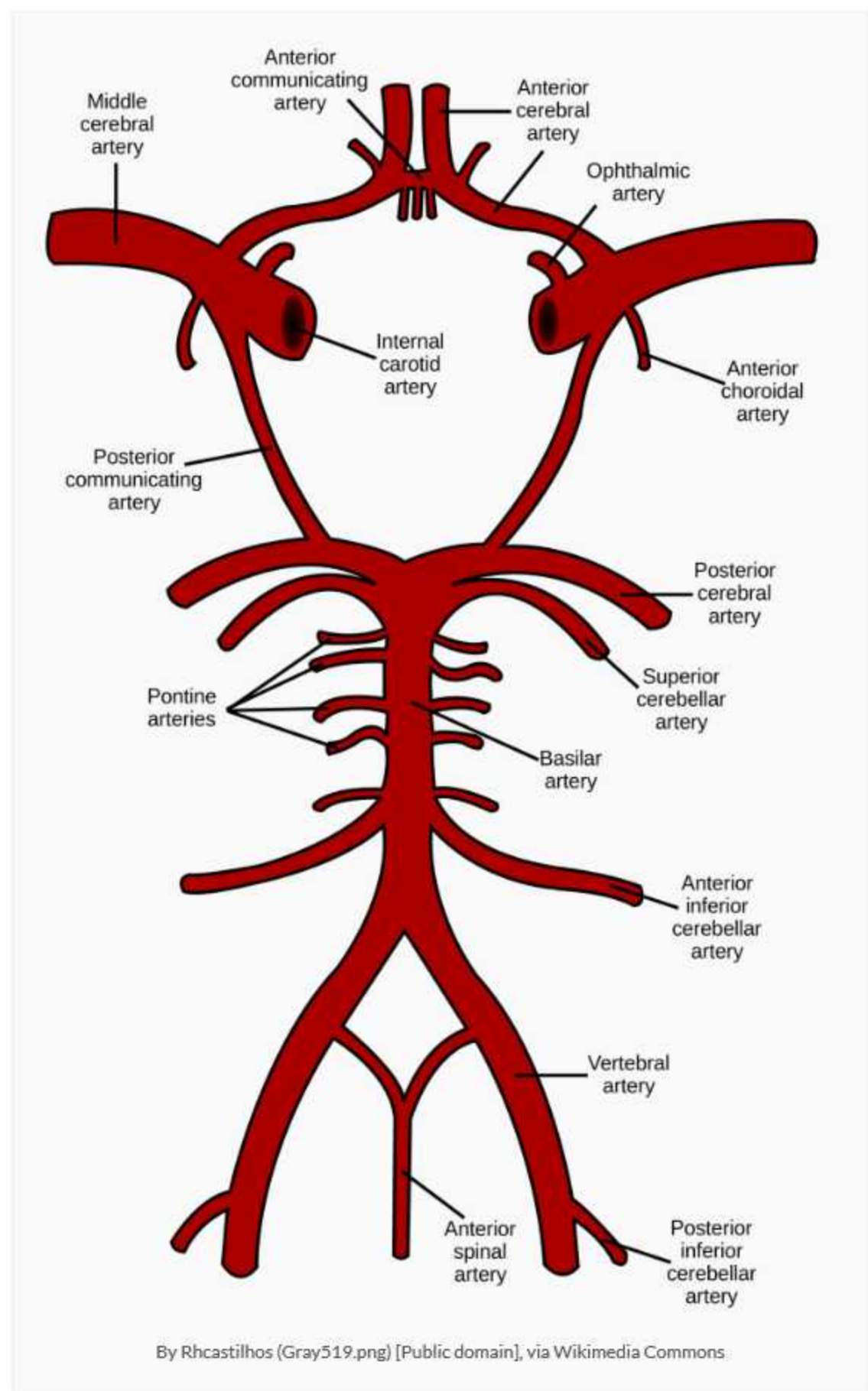
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebral artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

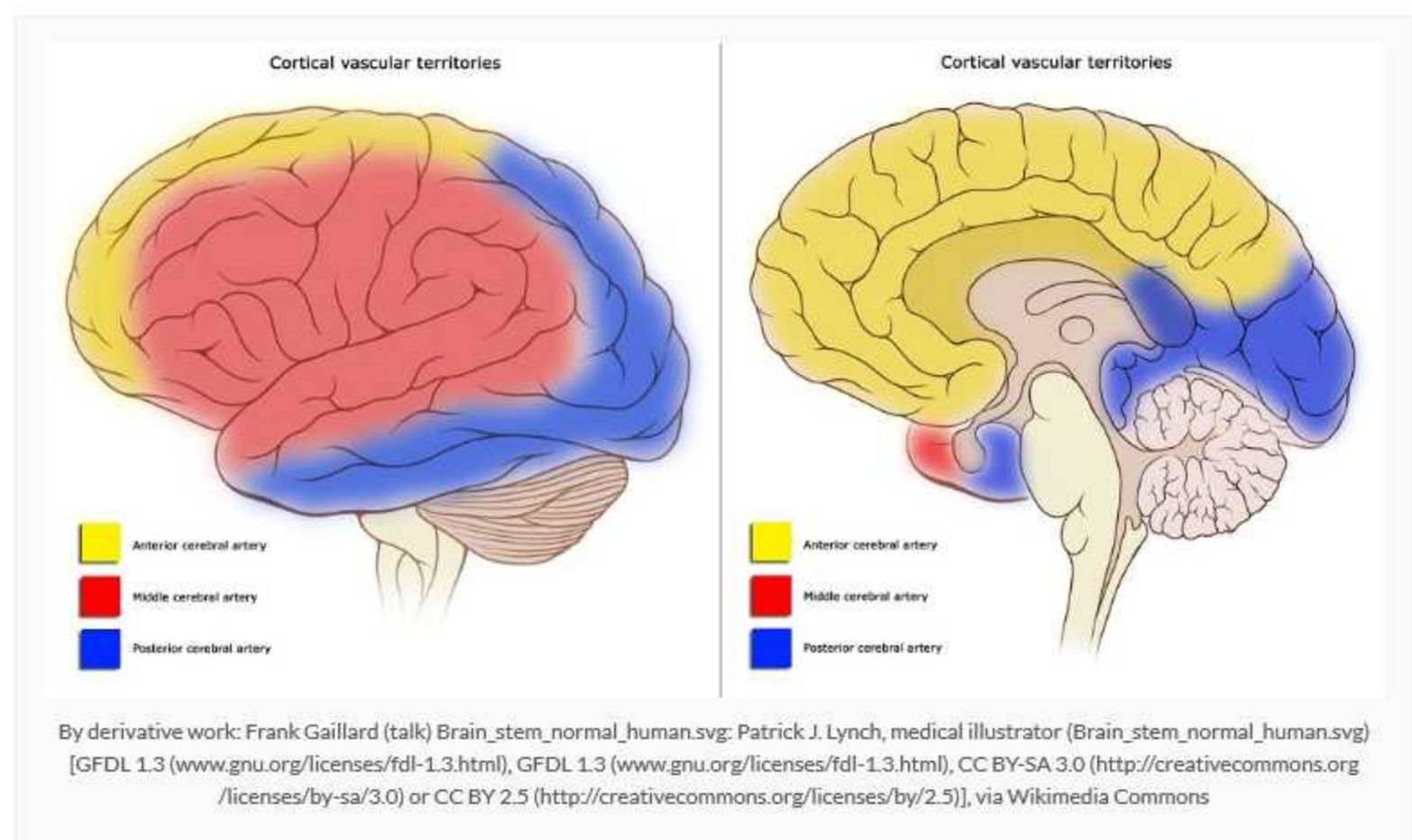
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change• PARIETAL LOBE: contralateral somatosensory loss in the lower limb• CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood• TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia• PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia• N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none">• OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral)• TEMPORAL LOBE: confusion, memory deficit• OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



Question Navigator

- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Current Question
- 68 ...
- 69 ...
- 70 ...
- 71 ...
- 72 ...
- 73 ...

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 68 of 142



A 28 year old male man is brought to ED having been hit in the head by a cricket ball. Imaging shows a fracture of the foramen rotundum. Which of the following nerves would most likely be injured:

- ☐ a Ophthalmic nerve
- ☐ b Maxillary nerve
- ☐ c Mandibular nerve
- ☐ d Facial nerve
- ☐ e Glossopharyngeal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Answered
- 68 Current Question
- 69 ...
- 70 ...
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 68 of 142

A 28 year old male man is brought to ED having been hit in the head by a cricket ball. Imaging shows a fracture of the foramen rotundum. Which of the following nerves would most likely be injured:

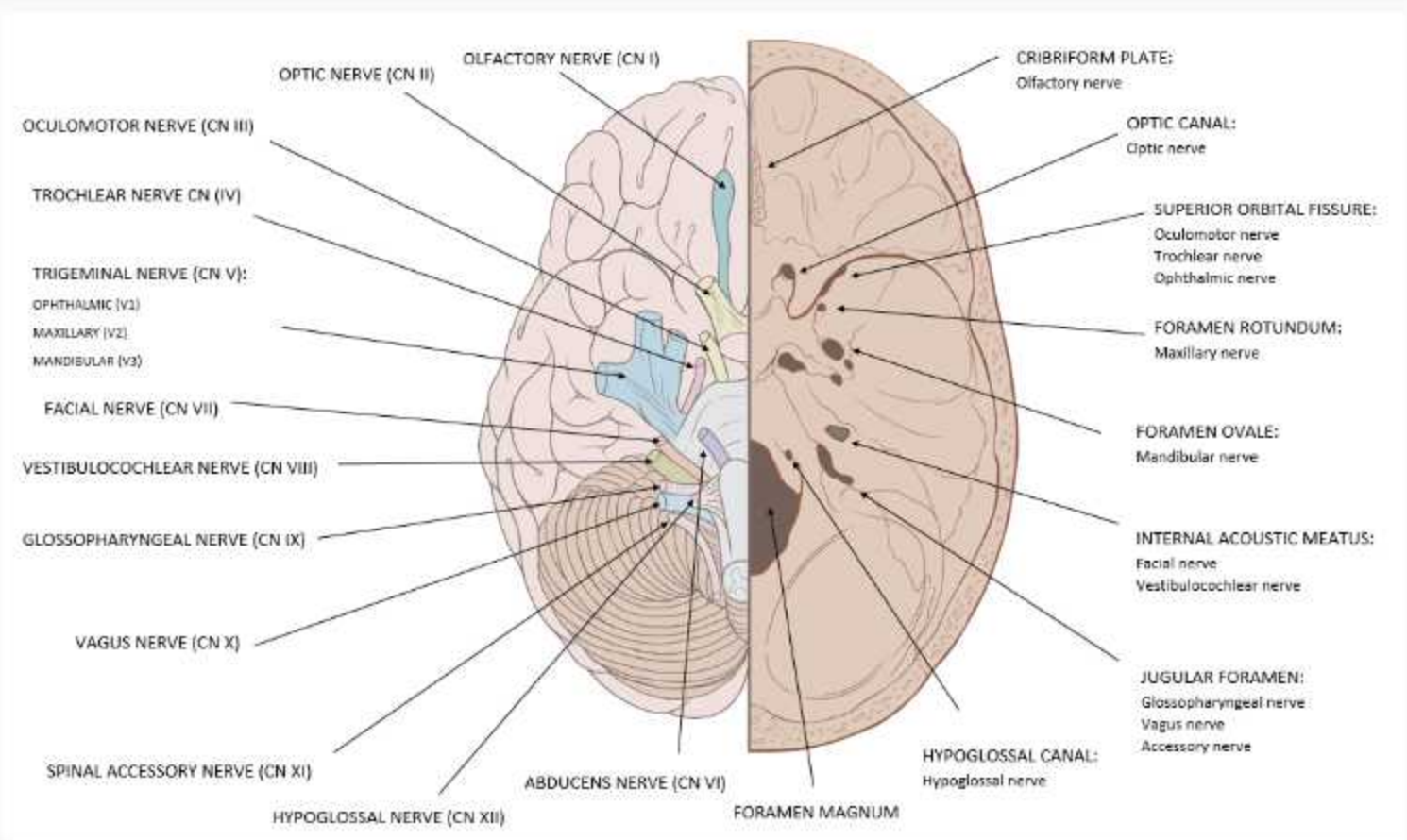
- a) Ophthalmic nerve
- b) Maxillary nerve
- c) Mandibular nerve
- d) Facial nerve
- e) Glossopharyngeal nerve

Answer

The maxillary nerve runs through the foramen rotundum.

Notes

The maxillary nerve is purely sensory. It originates from the trigeminal ganglia in the cranial cavity and enters the pterygopalatine fossa through the foramen rotundum.

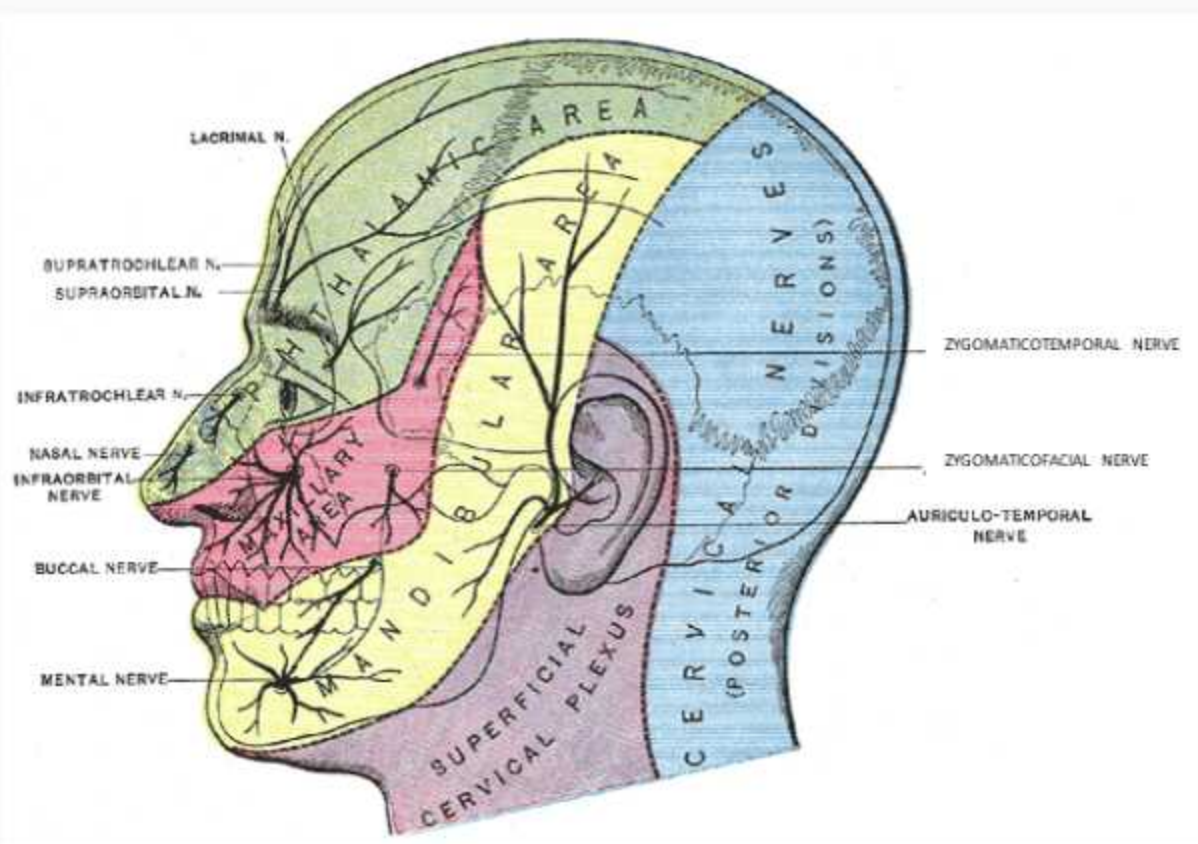


Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

The maxillary nerve (via its branches) supplies sensation to:

- the orbital wall
- the sphenoidal and ethmoidal sinuses
- the mucosa and glands of the hard palate and associated gingiva
- the nasal cavity
- the soft palate
- the upper teeth and associated gingiva
- the nasopharynx
- skin over the temple and the zygomatic bone
- the maxillary sinus
- the lateral aspect of the external nose and part of the nasal septum
- skin of the lower eyelid and its conjunctiva
- skin over the cheek and upper lip and associated oral mucosa
- part of the cranial dura mater.

It also supplies parasympathetic fibres to the lacrimal glands and nasal glands.



By Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5], via Wikimedia Commons

Question Navigator

62	Answered
63	Answered
64	Answered
65	Answered
66	Answered
67	Answered
68	Current Question
69	...
70	...
71	...
72	...
73	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 69 of 142

Which of the following best describes the position of the temporal lobe:



- ☐ a Posterior to the parieto-occipital sulcus
- ☐ b Anterior to the central sulcus and superior to the lateral sulcus
- ☐ c Posterior to the central sulcus and superior to the lateral sulcus
- ☐ d Inferior to the lateral sulcus
- ☐ e Inferior to the parieto-occipital sulcus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Answered
- 68 Answered
- 69 Current Question
- 70 ...
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 69 of 142



Which of the following best describes the position of the temporal lobe:

- a) Posterior to the parieto-occipital sulcus
- b) Anterior to the central sulcus and superior to the lateral sulcus
- c) **Posterior to the central sulcus and superior to the lateral sulcus** ✗
- d) Inferior to the lateral sulcus ✓
- e) Inferior to the parieto-occipital sulcus

Answer

The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the lateral sulcus.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebral cortex

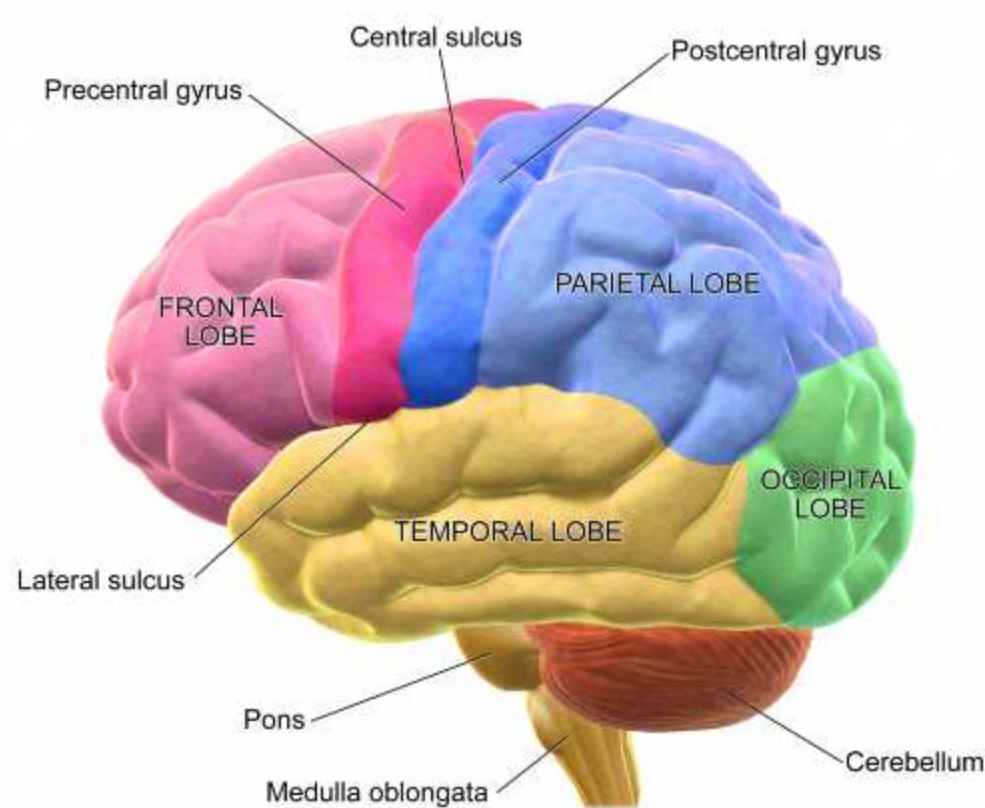
The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus

Lateral View of the Brain



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

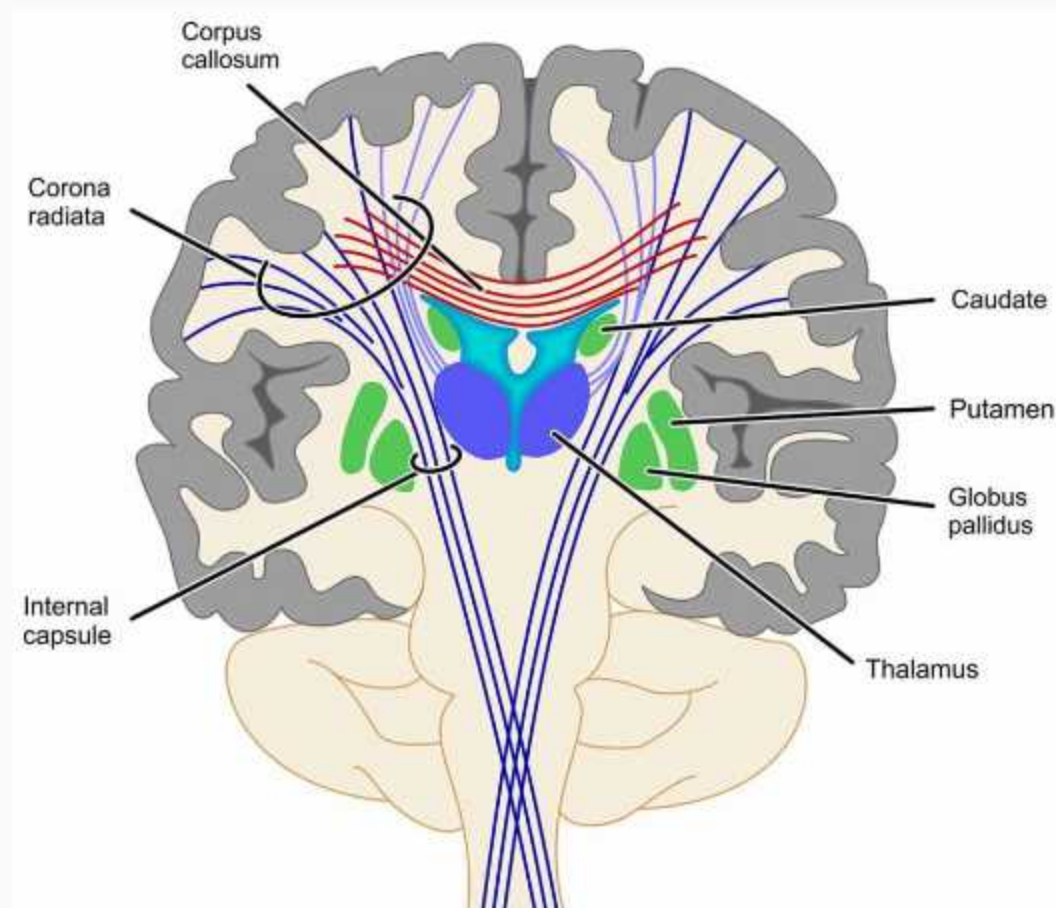
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 70 of 142



Regarding the glossopharyngeal nerve, which of the following statements is CORRECT:

- ☐ a It is the efferent nerve of the gag reflex.
- ☐ b It emerges from the cranial cavity through the hypoglossal canal.
- ☐ c It carries taste from the anterior two-thirds of the tongue.
- ☐ d It innervates the tensor veli palatini muscle.
- ☐ e It provides parasympathetic secretomotor fibres to the parotid gland.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Answered
- 68 Answered
- 69 Answered
- 70 Current Question
- 71 ...
- 72 ...
- 73 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Regarding the glossopharyngeal nerve, which of the following statements is CORRECT:

- Answer**

Notes

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Something wrong?

- [Advanced Life Support Group](#)
- [Emergency Medicine Journal](#)
- [Lifeinthefastlane](#)
- [Instant Anatomy](#)
- [Patient.co.uk](#)



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 71 of 142



A 54 year old man presents to ED with severe headaches and vomiting. Imaging shows a tumour causing compression at the jugular foramen. Which of the following clinical features would you most expect to see in this patient:

- ☐ a Inability to close the eye
- ☐ b Loss of sensation over the face
- ☐ c Loss of tongue movements
- ☒ d Loss of gag reflex
- ☐ e Loss of hearing

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Answered
- 68 Answered
- 69 Answered
- 70 Answered
- 71 Current Question
- 72 ...
- 73

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 71 of 142



A 54 year old man presents to ED with severe headaches and vomiting. Imaging shows a tumour causing compression at the jugular foramen. Which of the following clinical features would you most expect to see in this patient:

- a) Inability to close the eye
- b) Loss of sensation over the face
- c) Loss of tongue movements
- d) Loss of gag reflex
- e) Loss of hearing

Answer

Both the glossopharyngeal nerve (afferent pathway of gag reflex) and the vagus nerve (efferent pathway of gag reflex), together with the spinal accessory nerve exit the skull through the jugular foramen. Hearing is primarily a function of the vestibulocochlear nerve. Sensation of the face is supplied by the trigeminal nerve. Muscles of facial expression (including those responsible for closing the eye) are innervated by the facial nerve. Tongue movements are primarily a function of the hypoglossal nerve.

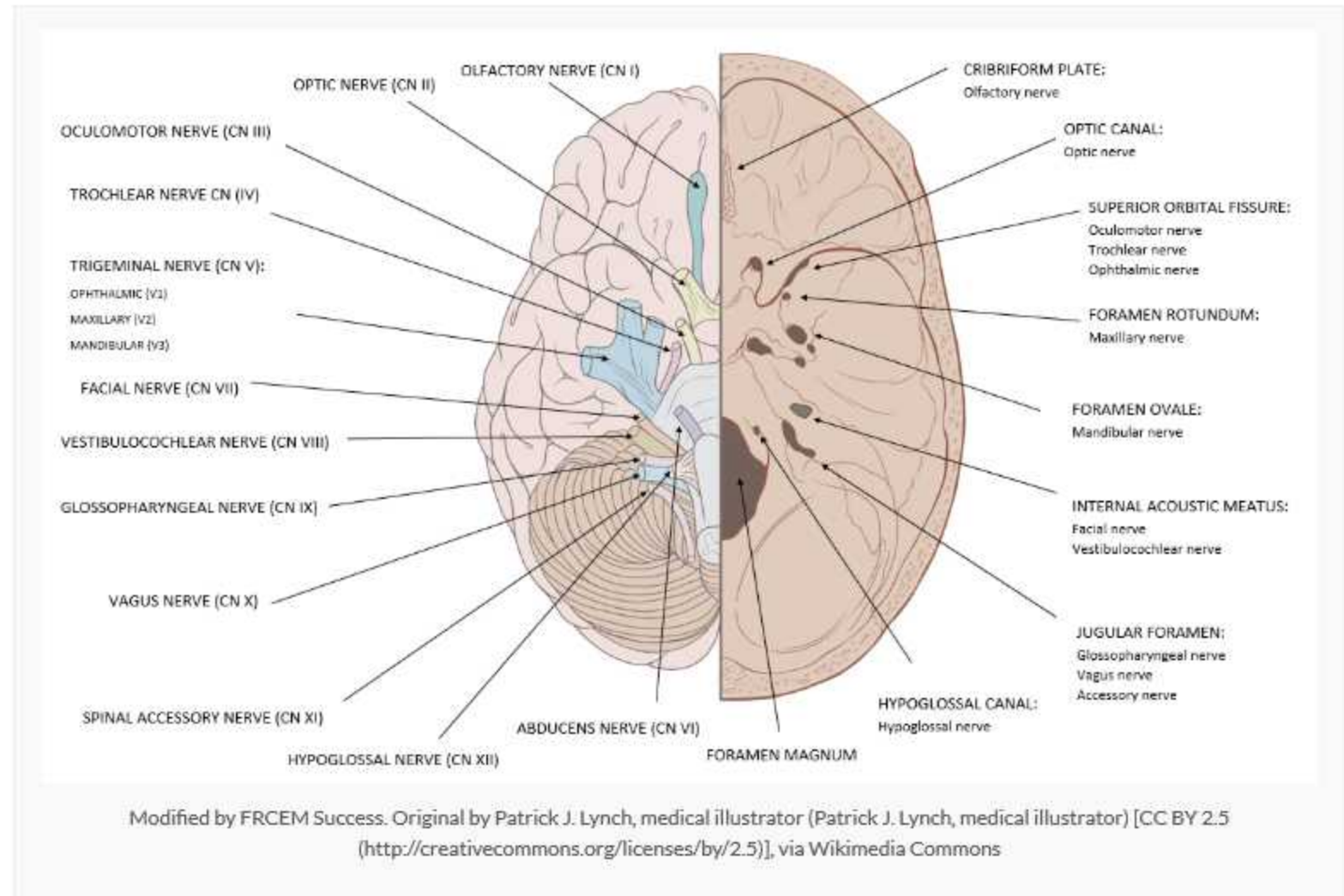
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say ‘ahhh’ to look for uvula deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvula deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvula will move asymmetrically when the patient says ‘ahh’ – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

Question Navigator

62	Answered
63	Answered
64	Answered
65	Answered
66	Answered
67	Answered
68	Answered
69	Answered
70	Answered
71	Current Question
72	...
73	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 72 of 142



The maxillary division of the trigeminal nerve exits the skull through the:

- ☐ a Foramen rotundum
- ☐ b Foramen ovale
- ☐ c Superior orbital fissure
- ☐ d Internal acoustic meatus
- ☐ e Jugular foramen

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Answered
- 68 Answered
- 69 Answered
- 70 Answered
- 71 Answered
- 72 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 72 of 142

The maxillary division of the trigeminal nerve exits the skull through the:

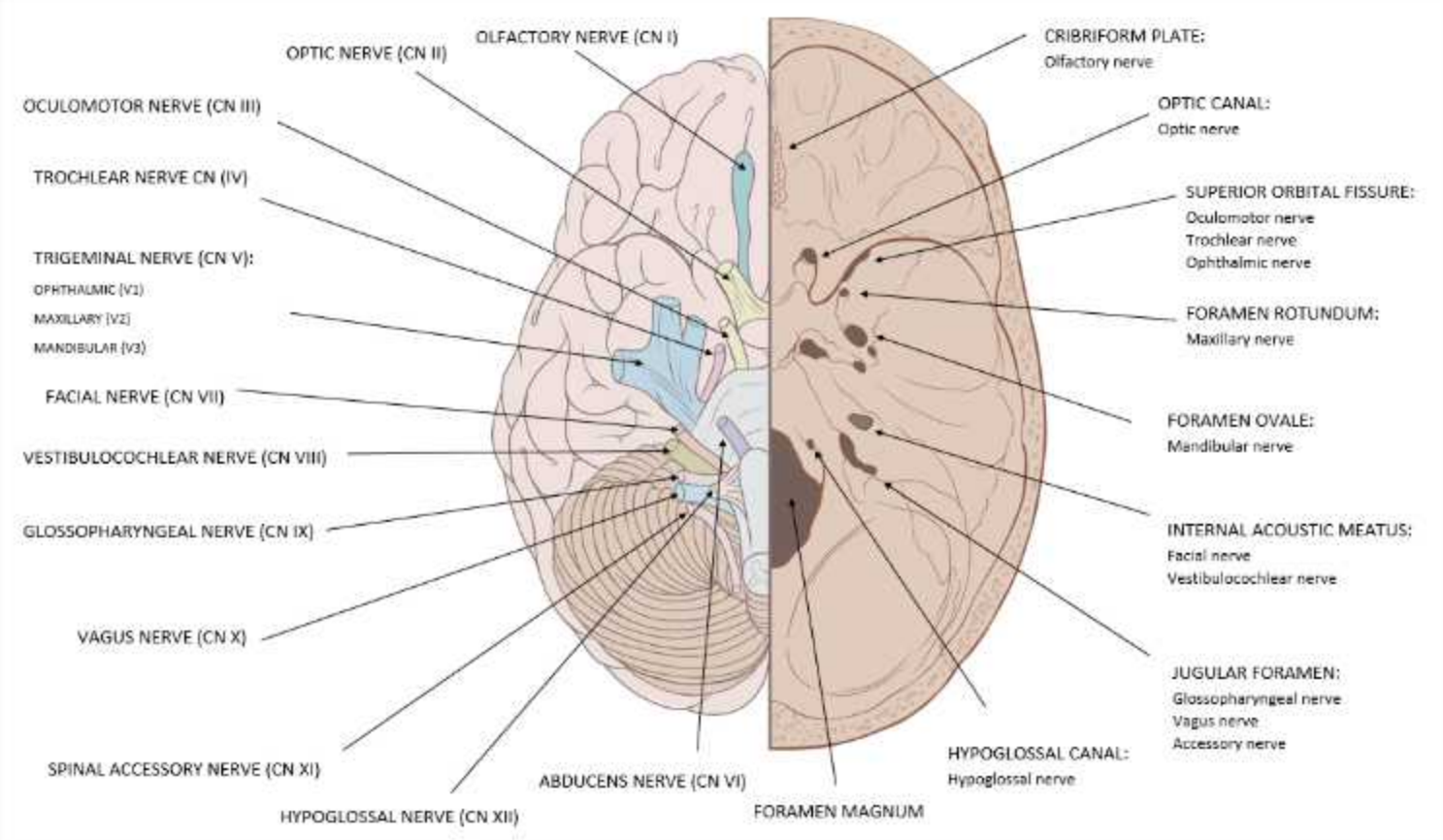
- a) Foramen rotundum
- b) Foramen ovale
- c) Superior orbital fissure
- d) Internal acoustic meatus
- e) Jugular foramen

Answer

The maxillary nerve exits the skull through the foramen rotundum.

Notes

The maxillary nerve is purely sensory. It originates from the trigeminal ganglia in the cranial cavity and enters the pterygopalatine fossa through the foramen rotundum.

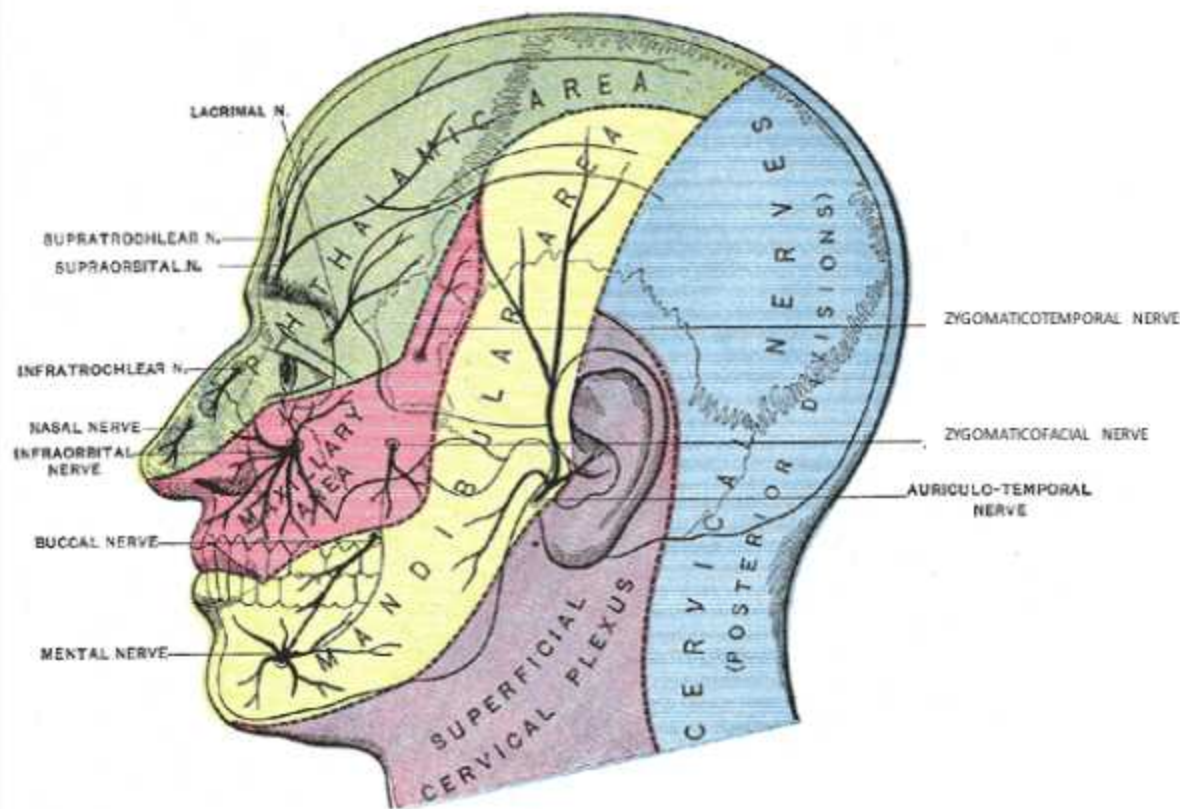


Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

The maxillary nerve (via its branches) supplies sensation to:

- the orbital wall
- the sphenoidal and ethmoidal sinuses
- the mucosa and glands of the hard palate and associated gingiva
- the nasal cavity
- the soft palate
- the upper teeth and associated gingiva
- the nasopharynx
- skin over the temple and the zygomatic bone
- the maxillary sinus
- the lateral aspect of the external nose and part of the nasal septum
- skin of the lower eyelid and its conjunctiva
- skin over the cheek and upper lip and associated oral mucosa
- part of the cranial dura mater.

It also supplies parasympathetic fibres to the lacrimal glands and nasal glands.



By Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5], via Wikimedia Commons

Question Navigator

61	Answered
62	Answered
63	Answered
64	Answered
65	Answered
66	Answered
67	Answered
68	Answered
69	Answered
70	Answered
71	Answered
72	Current Question
73	

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 73 of 142



The facial nerve exits the posterior cranial fossa through which of the following:

- ☐ a Foramen rotundum
- ☐ b Hypoglossal canal
- ☐ c Foramen ovale
- ☐ d Internal acoustic meatus
- ☐ e Jugular foramen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 61 Answered
- 62 Answered
- 63 Answered
- 64 Answered
- 65 Answered
- 66 Answered
- 67 Answered
- 68 Answered
- 69 Answered
- 70 Answered
- 71 Answered
- 72 Answered
- 73 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 73 of 142



The facial nerve exits the posterior cranial fossa through which of the following:

- a) Foramen rotundum
- b) Hypoglossal canal
- c) Foramen ovale
- d) **Internal acoustic meatus** ✓
- e) Jugular foramen

Answer

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

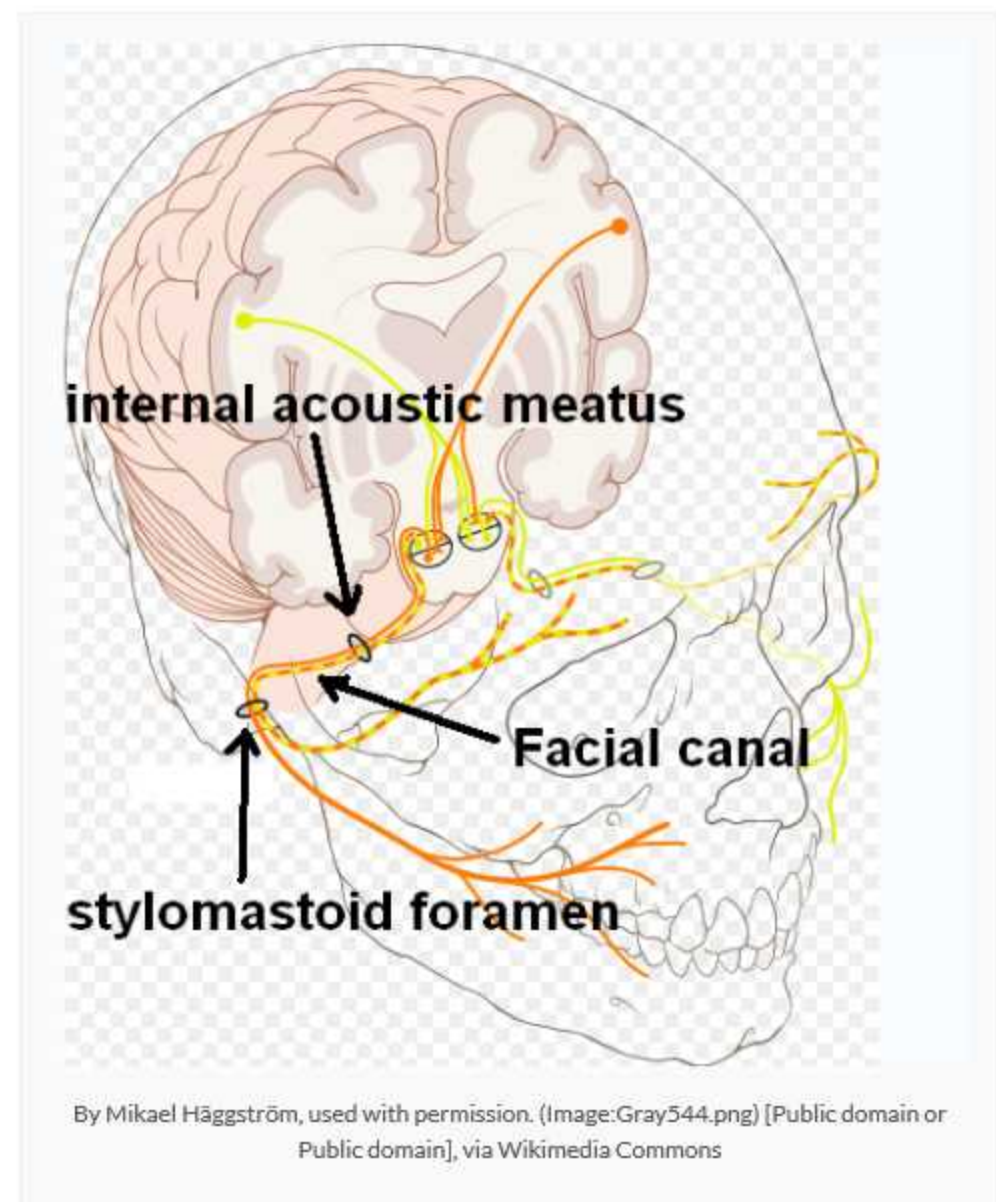
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

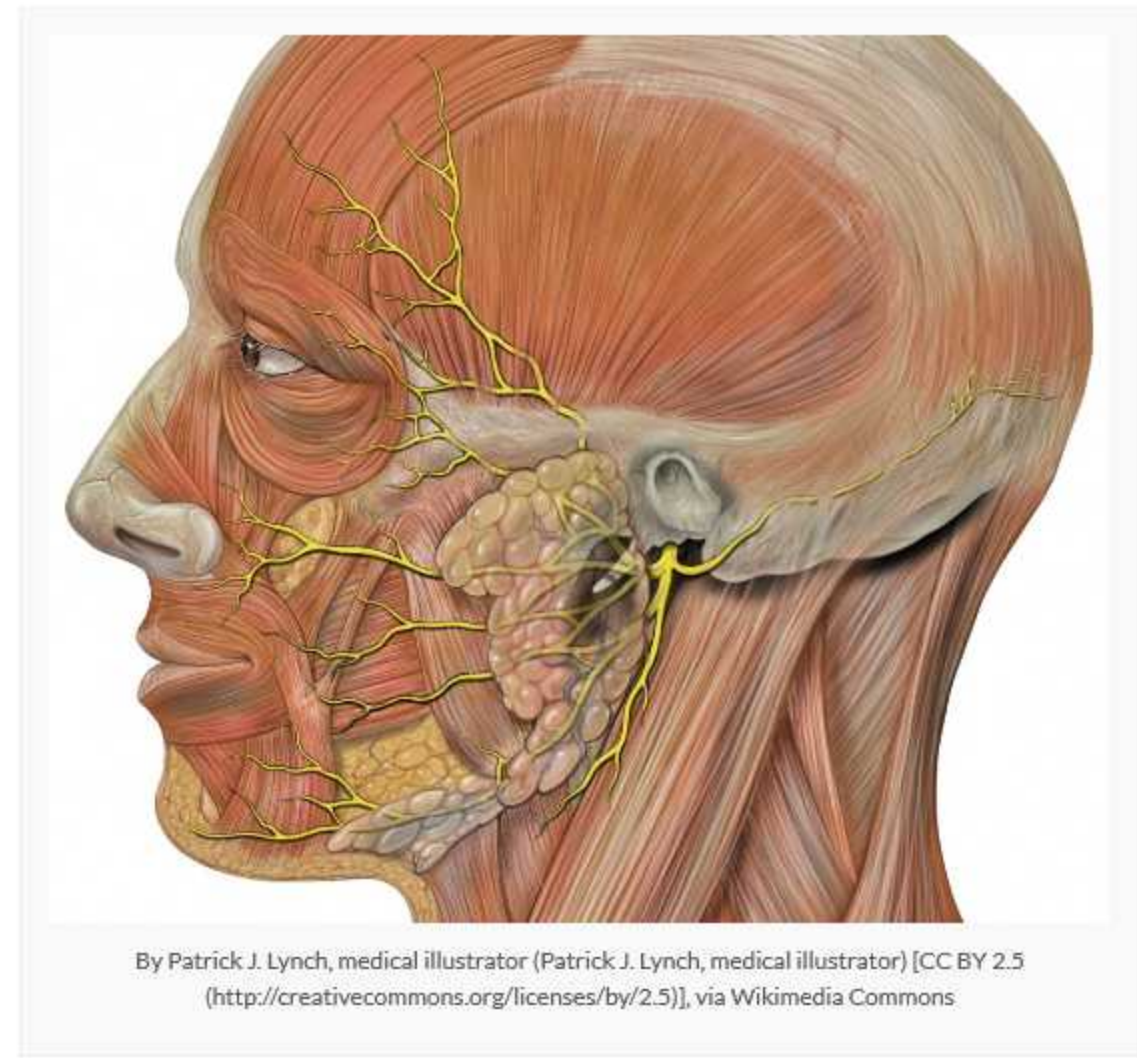
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[<< Previous](#)
[Next >>](#)
[Something wrong?](#)

Question Navigator

61	Answered
62	Answered
63	Answered
64	Answered
65	Answered
66	Answered
67	Answered
68	Answered
69	Answered
70	Answered
71	Answered
72	Answered
73	Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeInTheFastLane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 74 of 142



The primary somatosensory cortex is located in which of the following regions:

- ☐ a Occipital lobe
- ☐ b Parietal lobe
- ☐ c Frontal lobe
- ☐ d Temporal lobe
- ☐ e Brainstem

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

74 Current Question

75 ...

76 ...

77 ...

78 ...

79 ...

80 ...

81 ...

82 ...

83 ...

84 ...

85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 74 of 142



The primary somatosensory cortex is located in which of the following regions:

- a) Occipital lobe
- b) Parietal lobe
- c) Frontal lobe
- d) Temporal lobe
- e) Brainstem

Answer

The primary somatosensory cortex is located in the postcentral gyrus of the parietal lobe and is concerned with perceiving complex somatosensory stimuli from the contralateral side of the face and body. Together with the somatosensory association cortex, these areas are responsible for sensation and proprioception, and visuo-spatial perception.

Notes

The parietal lobe lies between the frontal lobe anteriorly and the occipital lobe posteriorly, from which it is separated by the central sulcus and parieto-occipital sulcus, respectively. It sits superiorly in relation to the temporal lobe, being separated by the lateral sulcus.

Areas of the parietal lobe are responsible for:

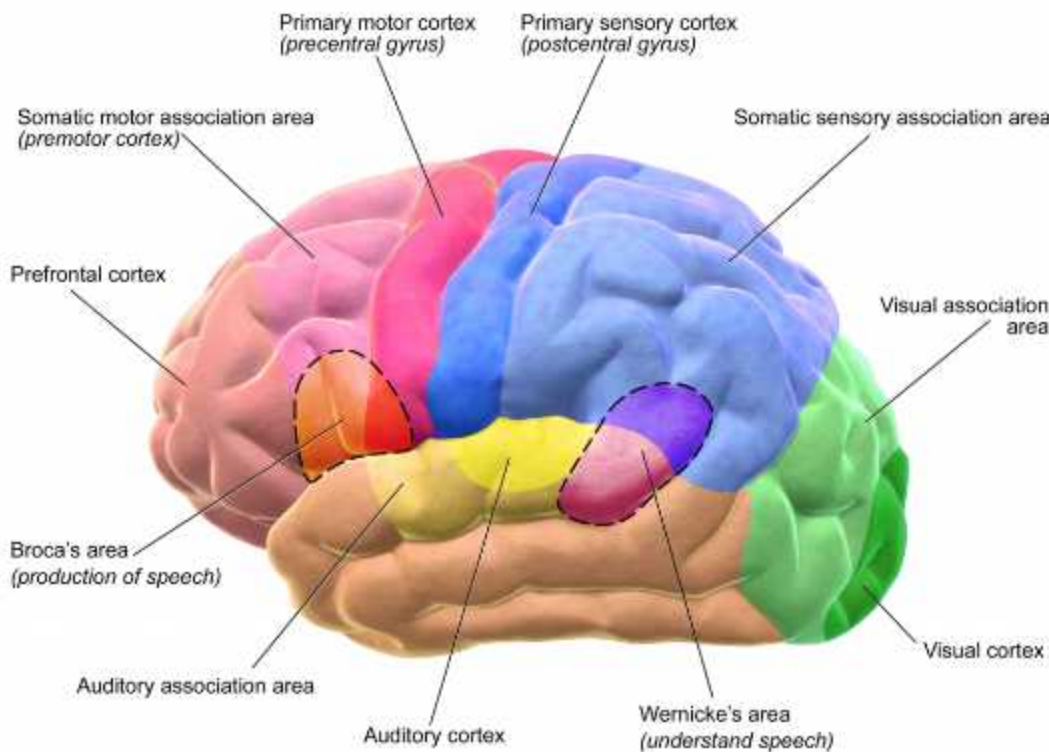
- Perceiving and interpreting sensation and proprioception
- Language and calculation of numbers on the dominant hemisphere side
- Integration of somatosensory, visual and auditory information and processing of visuospatial functions (e.g. 2-point discrimination) on the non-dominant hemisphere side

Area	Function	Lesion
Primary somatosensory cortex and somatosensory association cortex	Sensation and proprioception, visuo-spatial perception	Loss of sensation, difficulty distinguishing left from right, sensory neglect, apraxia, loss of hand-eye coordination, tactile agnosia
Arcuate fasciculus	Connects audiovisual association areas with Broca and Wernicke speech areas	Difficulties with reading, writing, naming, maths
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous inferior quadrantanopia

Areas of the parietal lobe

- The primary somatosensory cortex is located in the postcentral gyrus and is concerned with perceiving complex somatosensory stimuli from the contralateral side of the face and body. Together with the somatosensory association cortex, these areas are responsible for sensation and proprioception, and visuo-spatial perception.
- Pathways within the arcuate fasciculus are concerned with language as they connect Broca's area (frontal lobe) with Wernicke's area (temporal lobe).
- The fibres of the upper part of the optic radiation (serving the lower quadrant of the contralateral visual field) pass deep within the parietal lobe.

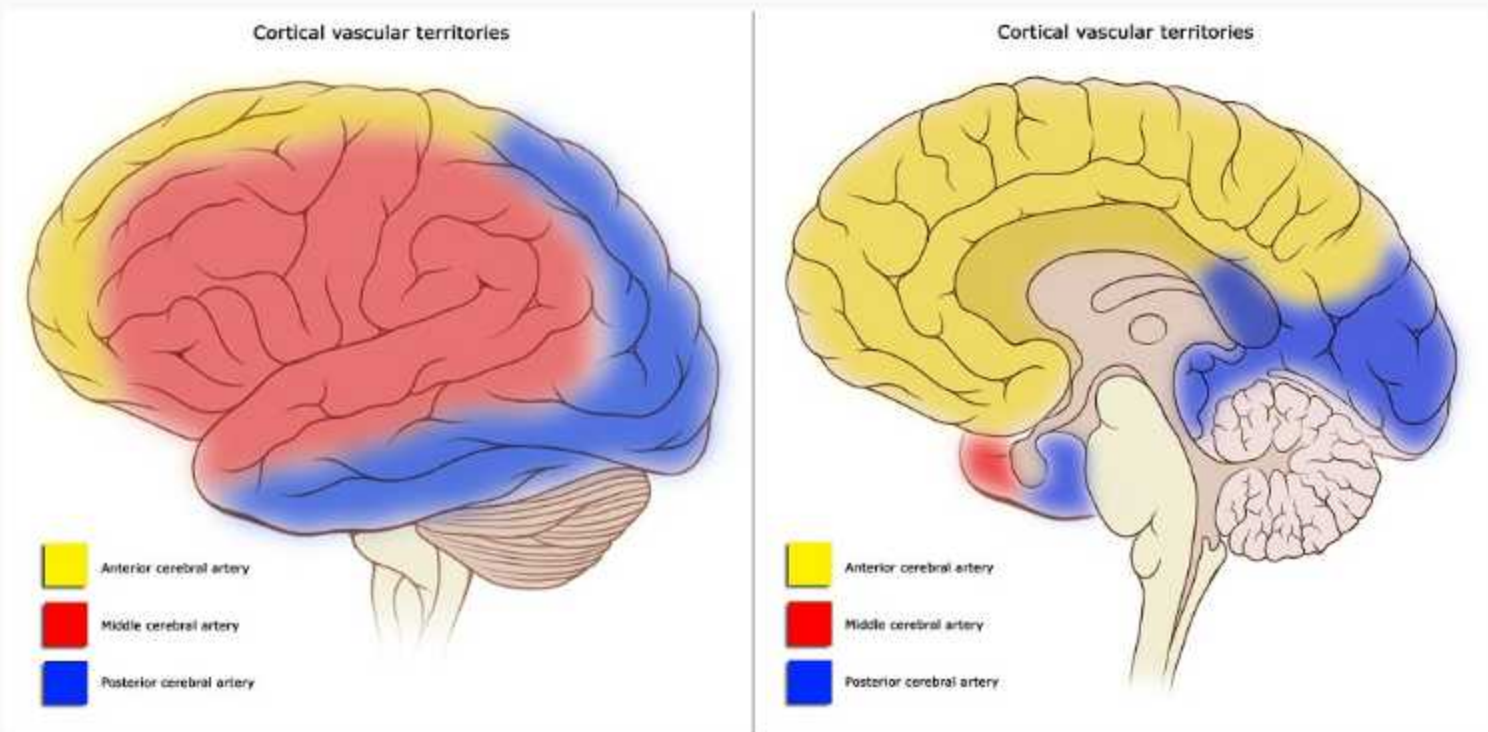
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the parietal lobe is from the middle cerebral artery.



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications:

Damage to the parietal lobe may result in:

- Cortical contralateral sensory loss with loss of proprioception and two-point discrimination
- Apraxia
- Tactile agnosia
- Attention deficits e.g. contralateral hemispatial neglect syndrome (an inability to perceive a contralateral stimulus when two simultaneous sensory stimuli are applied with equal intensity to corresponding sites on opposite sides of the body)
- Visual field defect (contralateral homonymous inferior quadrantanopia)

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 75 of 142



What type of visual field defect would you most likely see in a lesion of the optic radiation of the left temporal lobe:

- ☐ a Left homonymous hemianopia
- ☐ b Left homonymous inferior quadrantanopia
- ☐ c Right homonymous inferior quadrantanopia
- ☐ d Left homonymous superior quadrantanopia
- ☐ e Right homonymous superior quadrantanopia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

74 Answered

75 Current Question

76 ...

77 ...

78 ...

79 ...

80 ...

81 ...

82 ...

83 ...

84 ...

85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 75 of 142



What type of visual field defect would you most likely see in a lesion of the optic radiation of the left temporal lobe:

- a) Left homonymous hemianopia
- b) Left homonymous inferior quadrantanopia
- c) Right homonymous inferior quadrantanopia
- d) Left homonymous superior quadrantanopia
- e) Right homonymous superior quadrantanopia ✓

Answer

The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.

Notes

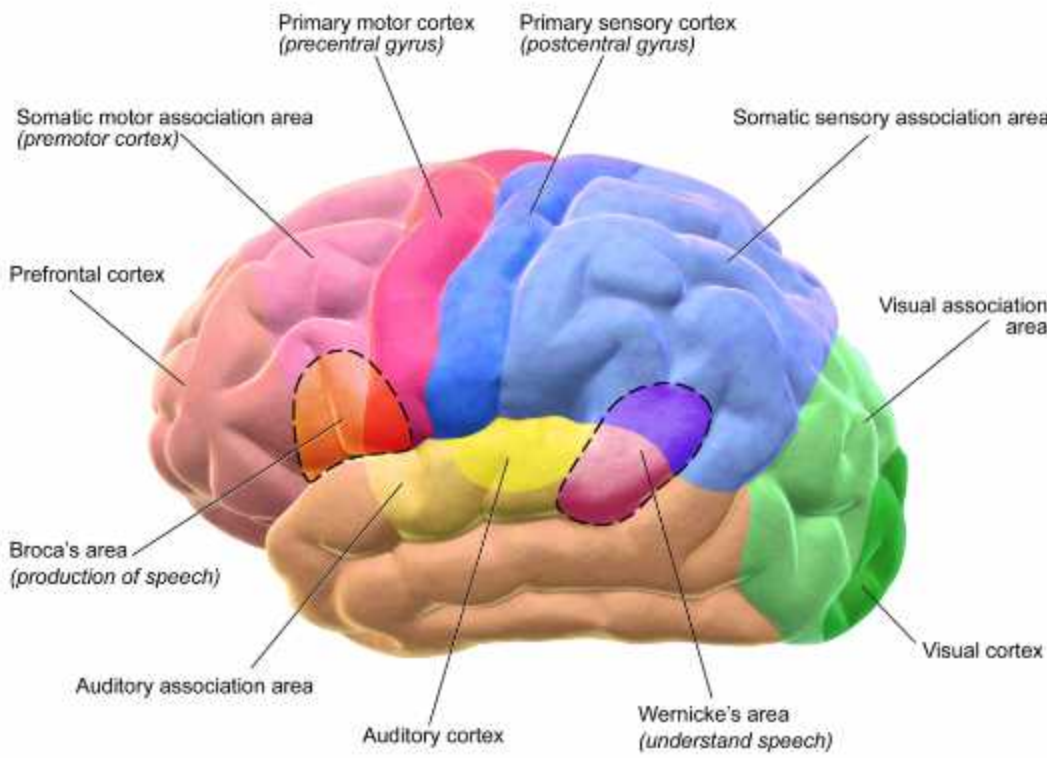
The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the frontal and parietal lobes, from which it is separated by the lateral sulcus.

Area	Function	Lesion
Wernicke speech area	Language comprehension	Receptive dysphasia
Primary auditory cortex and auditory association area	Perception and recognition of auditory stimuli	Partial cortical deafness, auditory agnosia
Limbic association cortex	Memory, learning, emotion	Memory impairment, increased aggression, difficulty recognising faces/objects
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous superior quadrantanopia

Areas of the temporal lobe

- The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. It is connected to the Broca speech area by the arcuate fasciculus.
- The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.
- The limbic association cortex is important in memory, learning and emotion.
- The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.

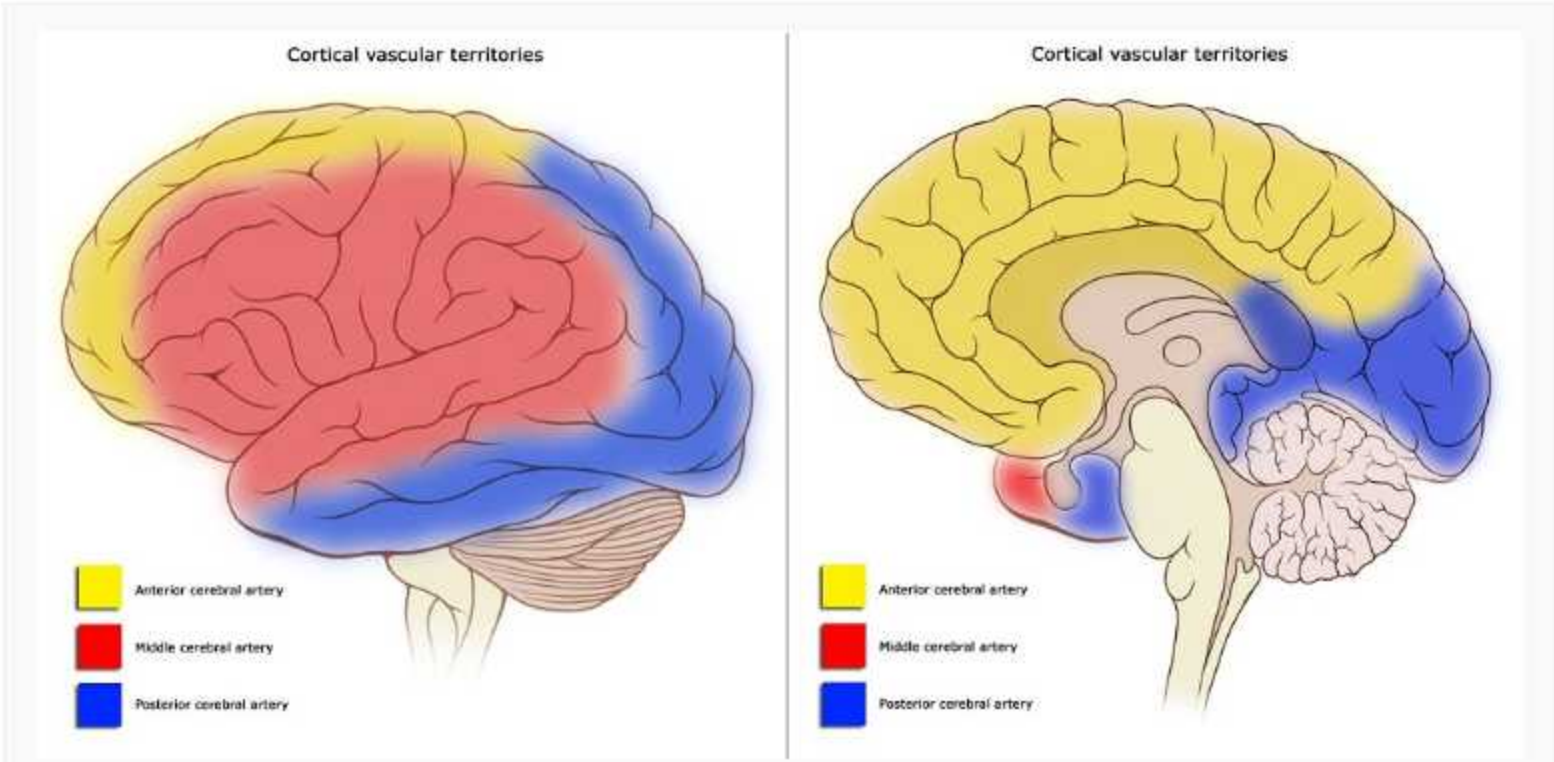
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg; Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the temporal lobe may result in:

- Receptive dysphasia – damage to the Wernicke speech area
- Visual field defect (contralateral homonymous superior quadrantanopia) – damage to the optic radiation
- Memory impairment – damage to the limbic system
- Emotional and behavioural disturbances – damage to the limbic system
- Auditory agnosia – damage to the primary auditory cortex or auditory association areas
- Partial cortical deafness (due to bilateral cochlear representation) – damage to the primary auditory cortex

Question Navigator

74	Answered
75	Current Question
76	...
77	...
78	...
79	...
80	...
81	...
82	...
83	...
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 76 of 142

Which of the following brainstem nuclei is NOT located in the pons:



- ☐ a Facial nucleus
- ☐ b Abducens nucleus
- ☐ c Trigeminal nuclei
- ☐ d Vestibulocochlear nuclei
- ☐ e Trochlear nucleus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

74 Answered

75 Answered

76 Current Question

77 ...

78 ...

79 ...

80 ...

81 ...

82 ...

83 ...

84 ...

85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 76 of 142



Which of the following brainstem nuclei is NOT located in the pons:

- a) Facial nucleus
- b) Abducens nucleus
- c) Trigeminal nuclei
- d) Vestibulocochlear nuclei
- e) Trochlear nucleus

Answer

The pons houses nuclei of the trigeminal nerve, the abducens nerve, the facial nerve and the vestibulocochlear nerve. The trochlear nucleus (together with the oculomotor nucleus) lies in the midbrain.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Brainstem

The brainstem comprises the midbrain, the pons and the medulla. It extends from the tentorial aperture to the level of C1. The medulla passes out of the cranial cavity via the foramen magnum and becomes the spinal cord as C1 roots emerge. The cells of the brainstem are predominantly clumped into nuclei.



By OpenStax [CC BY 4.0 (http://creativecommons.org/licenses/by/4.0)], via Wikimedia Commons

Midbrain

The midbrain lies predominantly within the posterior cranial fossa. The aperture in the tentorium cerebelli lies on its dorsal surface. The midbrain receives its blood supply from the posterior cerebral and superior cerebellar arteries (ex-basilar). Dopaminergic cells sit within the midbrain within the substantia nigra; loss of dopaminergic neurons is the basis of Parkinson's disease.

Pons

The pons houses nuclei of the trigeminal nerve, the abducens nerve, the facial nerve and the vestibulocochlear nerve. This knowledge allows prediction of the clinical effects of a pontine haemorrhage:

- Abducens nucleus (lateral rectus paralysis)
- Vestibular nuclei (nystagmus, nausea, vomiting, vertigo)
- Cochlear nuclei (central nerve deafness)
- Trigeminal nuclei (paralysis of muscles of mastication, jaw deviation, loss of facial sensation)
- Facial nucleus (facial nerve paralysis and loss of taste sensation from anterior tongue)

The pons receives its blood supply from pontine branches of the basilar artery.

Medulla

The medulla oblongata is the upward continuation of the spinal cord. It receives its blood supply from the posterior inferior cerebellar arteries and branches of the vertebral and basilar arteries.

Lateral medullary syndrome results from occlusion of the intracranial portion of the vertebral artery (most commonly) or of the posterior inferior cerebellar artery (PICA). The resultant structures affected are the:

- Vestibular nuclei (nystagmus, nausea, vomiting, vertigo)
- Inferior cerebellar peduncle (cerebellar signs)
- Nucleus ambiguus of glossopharyngeal and vagus nerve (ipsilateral laryngeal, pharyngeal and palatal paralysis with dysarthria, dysphagia, dysphonia)
- Spinothalamic tracts (contralateral loss of pain and temperature from trunk and limbs)
- Spinal trigeminal nucleus and tract (ipsilateral loss of pain and temperature from face)
- Descending sympathetic tract (ipsilateral Horner's syndrome)

Medial medullary syndrome results from occlusion of small perforating branches from the vertebral or proximal basilar artery such as the anterior spinal artery. The resultant structures affected are the:

- Corticospinal tract (contralateral hemiparesis of trunk and extremities)
- Medial lemniscus (contralateral loss of proprioception, two-point discrimination and vibration of trunk and limbs)
- Hypoglossal nerve roots (ipsilateral flaccid paralysis of tongue)

Question Navigator

74	Answered
75	Answered
76	Current Question
77	...
78	...
79	...
80	...
81	...
82	...
83	...
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 77 of 142



Regarding the vagus nerve, which of the following statements is INCORRECT:

- ☐ a The vagus nerve is a motor and sensory nerve.
- ☐ b The vagus nerve originates in the medulla.
- ☐ c The vagus nerve exits the skull via the jugular foramen.
- ☐ d It is the afferent nerve of the gag reflex.
- ☐ e It innervates the palatoglossal muscle of the tongue.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Current Question
- 78 ...
- 79 ...
- 80 ...
- 81 ...
- 82 ...
- 83 ...
- 84 ...
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 77 of 142



Regarding the vagus nerve, which of the following statements is INCORRECT:

- a) The vagus nerve is a motor and sensory nerve.
- b) The vagus nerve originates in the medulla.
- c) The vagus nerve exits the skull via the jugular foramen.
- d) It is the afferent nerve of the gag reflex.
- e) It innervates the palatoglossal muscle of the tongue.

Answer

The vagus nerve is the efferent nerve of the gag reflex (the glossopharyngeal nerve is the afferent nerve).

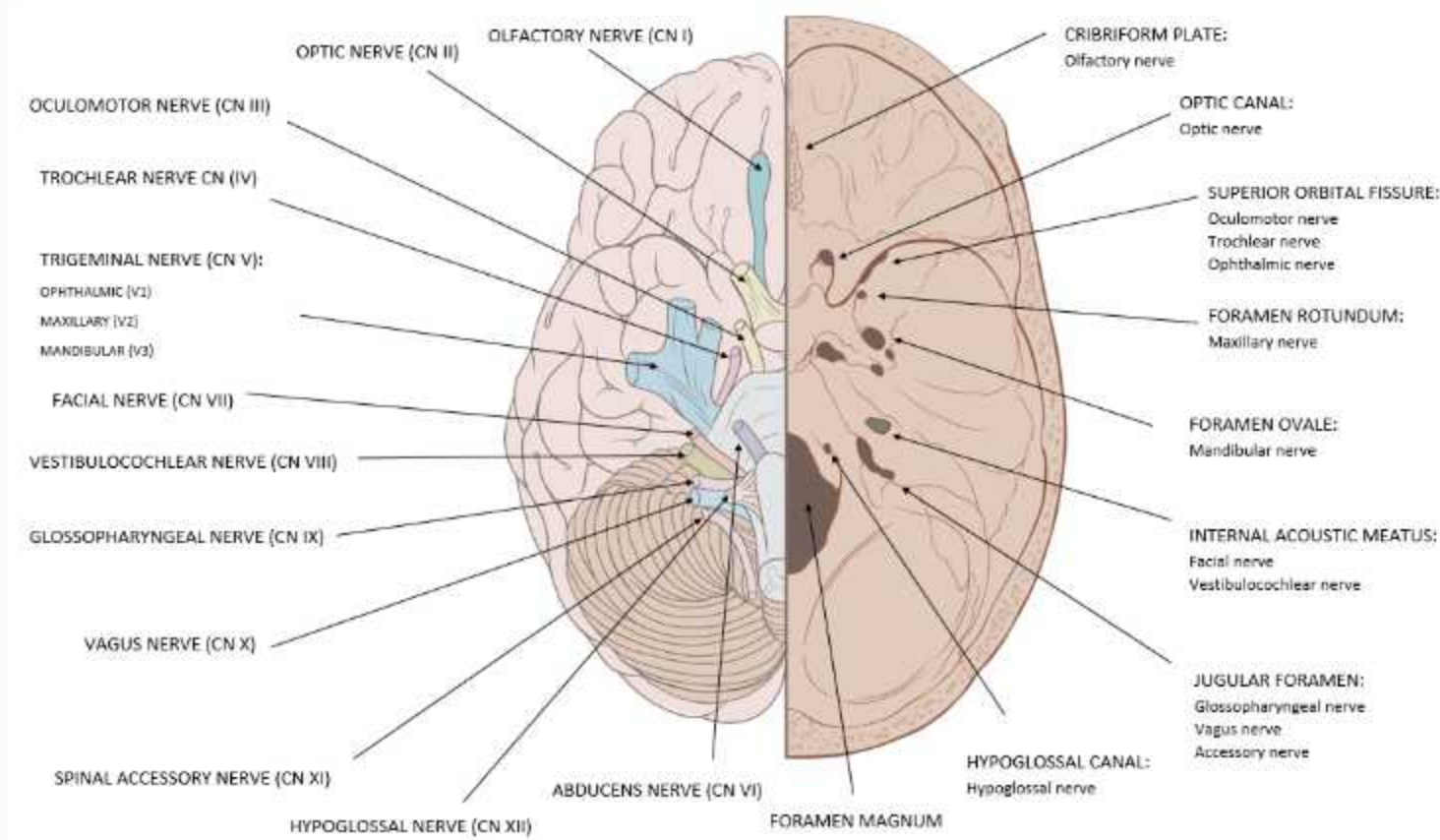
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say 'ahhh' to look for uvula deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvula deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvula will move asymmetrically when the patient says 'ahh' – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

Question Navigator

74	Answered
75	Answered
76	Answered
77	Current Question
78	...
79	...
80	...
81	...
82	...
83	...
84	...
85	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 78 of 142



Regarding the facial nerve, which of the following statements is INCORRECT:

- ☐ a Forehead sparing in facial nerve palsy is indicative of a lower motor neuron lesion.
- ☐ b The facial nerve supplies taste to the anterior two-thirds of the tongue.
- ☒ c The facial nerve carries parasympathetic fibres to the lacrimal glands.
- ☐ d The facial nerve leaves the brainstem at the cerebellopontine angle.
- ☐ e The facial nerve exits the skull via the stylomastoid foramen.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Answered
- 78 Current Question
- 79 ...
- 80 ...
- 81 ...
- 82 ...
- 83 ...
- 84 ...
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 78 of 142



Regarding the facial nerve, which of the following statements is INCORRECT:

- a) Forehead sparing in facial nerve palsy is indicative of a lower motor neuron lesion. ✓
- b) The facial nerve supplies taste to the anterior two-thirds of the tongue.
- c) The facial nerve carries parasympathetic fibres to the lacrimal glands.
- d) The facial nerve leaves the brainstem at the cerebellopontine angle.
- e) **The facial nerve exits the skull via the stylomastoid foramen.** ✗

Answer

In facial nerve palsy, if the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows due to paralysis of the orbicularis oculi and occipitofrontalis muscle respectively. If the damage is central (UMN), there is forehead sparing as the occipitofrontalis and orbicularis oculi muscles have bilateral cortical representation.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

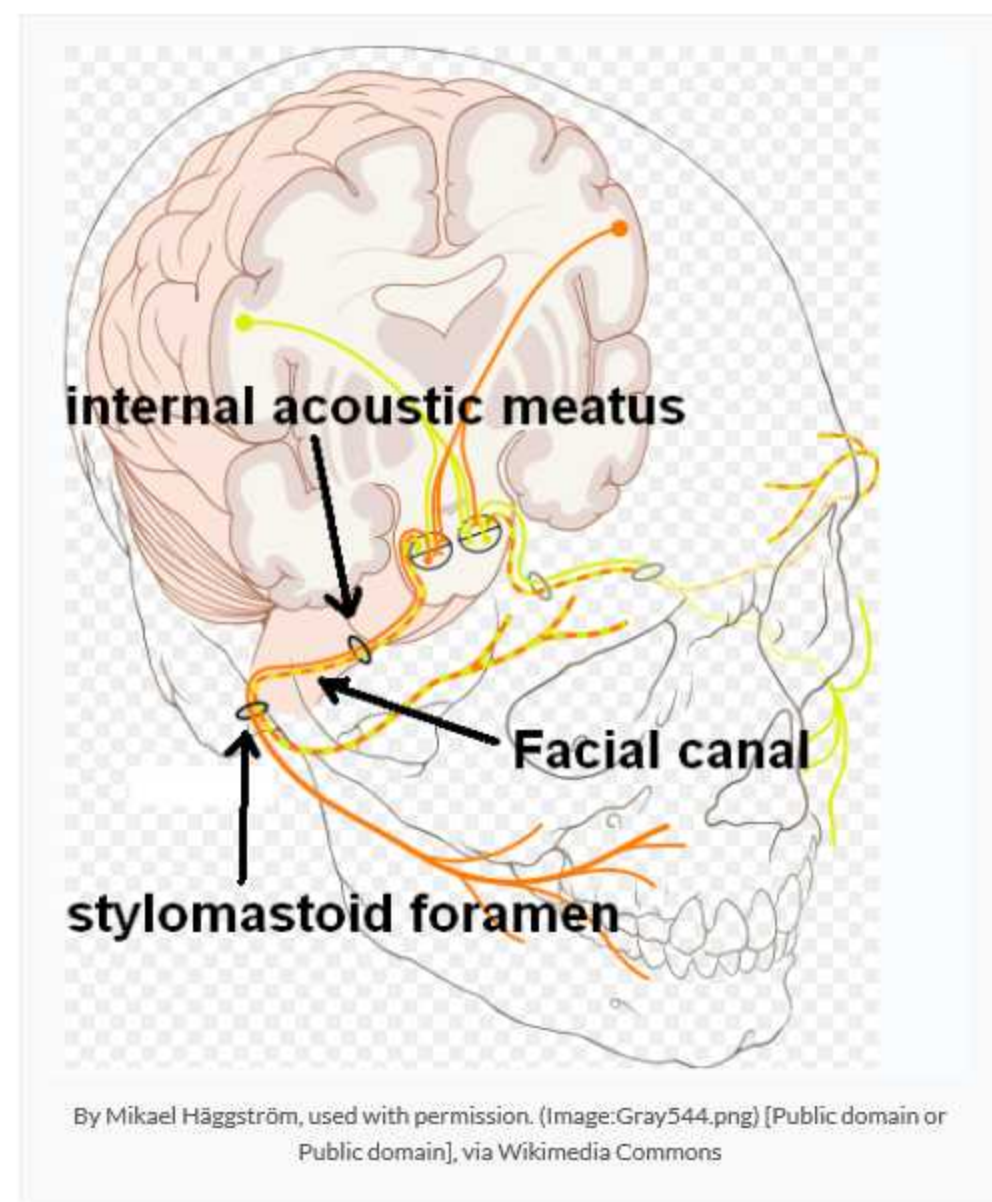
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

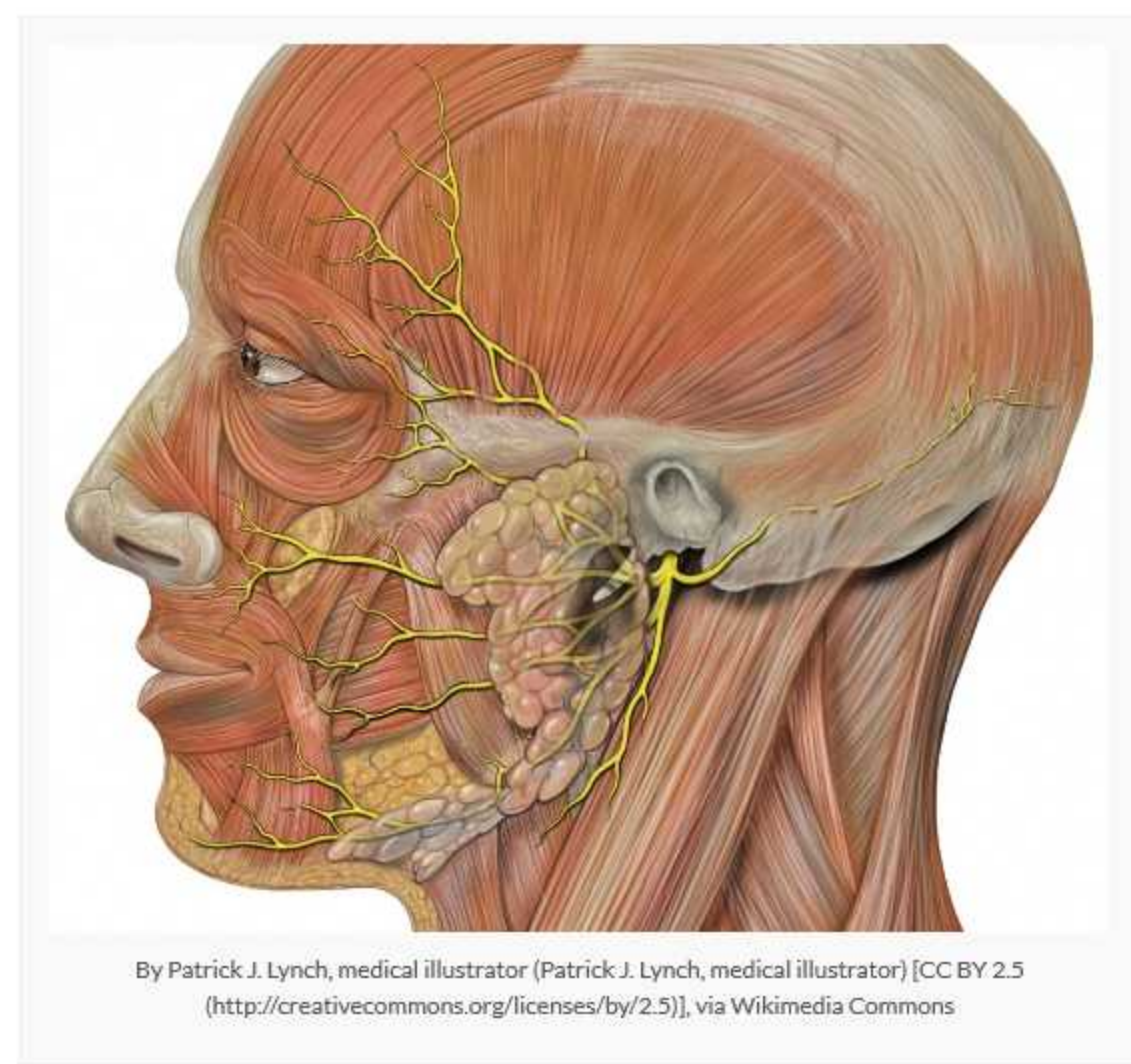
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[< Previous](#)
[Next >](#)

Something wrong?

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Current Question
79	...
80	...
81	...
82	...
83	...
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 79 of 142



Which of the following clinical features is NOT typical for a vagal nerve palsy:

- ☐ a Uvula deviation away from the affected side
- ☐ b Tongue deviation away from the affected side
- ☐ c Hoarseness
- ☐ d Loss of gag reflex
- ☐ e Dysphagia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Answered
- 78 Answered
- 79 Current Question
- 80 ...
- 81 ...
- 82 ...
- 83 ...
- 84 ...
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 79 of 142



Which of the following clinical features is NOT typical for a vagal nerve palsy:

- a) **Uvula deviation away from the affected side** ✖
- b) Tongue deviation away from the affected side ✔
- c) Hoarseness
- d) Loss of gag reflex
- e) Dysphagia

Answer

The hypoglossal nerve innervates most of the muscles of the tongue and if damaged may result in tongue deviation on protrusion away from the affected side.

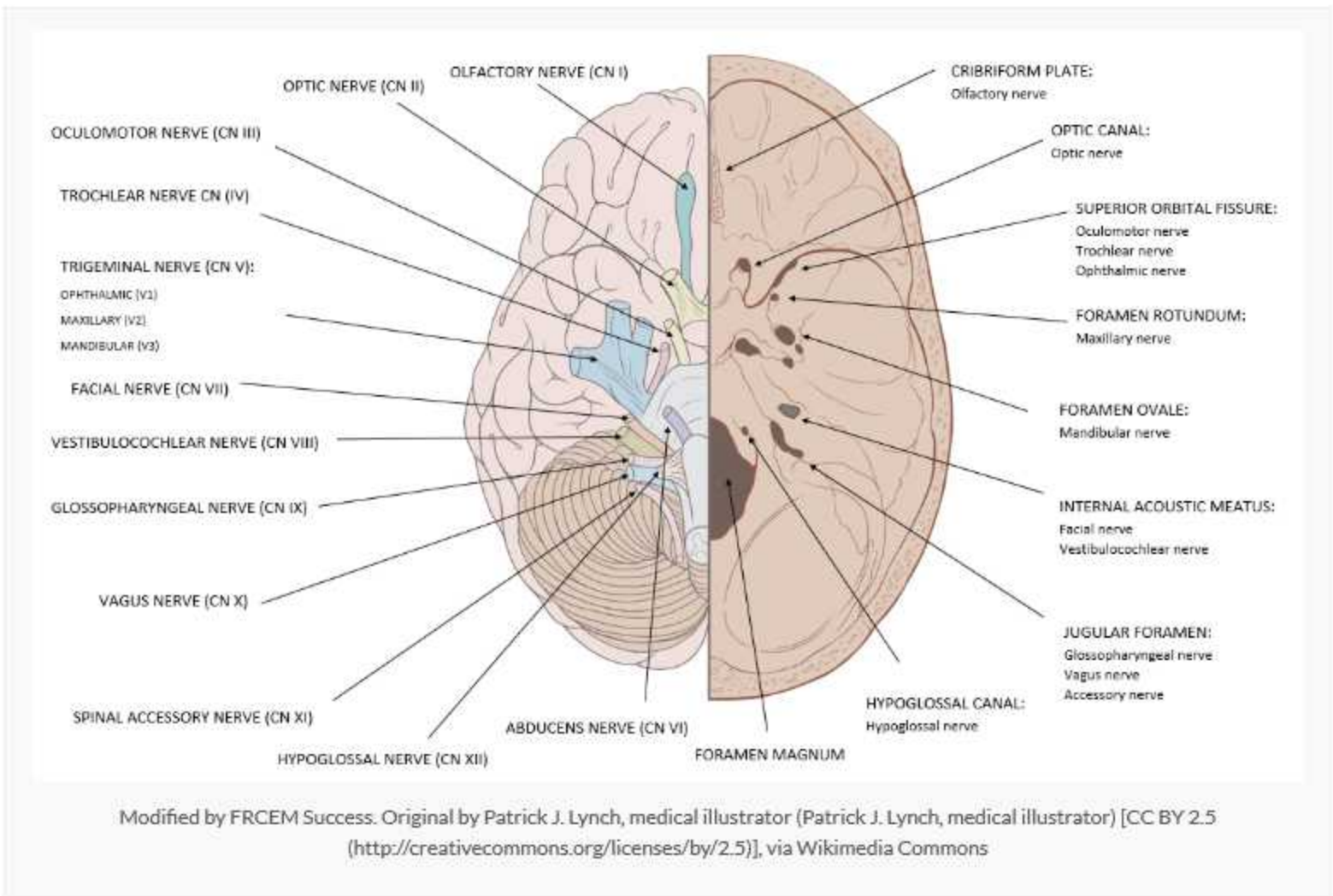
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say 'ahhh' to look for uvula deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvula deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvula will move asymmetrically when the patient says 'ahh' – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Answered
79	Current Question
80	...
81	...
82	...
83	...
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 80 of 142



What type of visual field defect are you most likely to see in a lesion of the optic nerve:

- ☐ a Bitemporal hemianopia
- ☐ b Contralateral homonymous inferior quadrantanopia
- ☐ c Contralateral homonymous hemianopia
- ☐ d Ipsilateral homonymous superior quadrantanopia
- ☐ e Monocular visual loss

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Answered
- 78 Answered
- 79 Answered
- 80 Current Question
- 81 ...
- 82 ...
- 83 ...
- 84 ...
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 80 of 142

What type of visual field defect are you most likely to see in a lesion of the optic nerve:

- a) Bitemporal hemianopia
- b) Contralateral homonymous inferior quadrantanopia
- c) Contralateral homonymous hemianopia
- d) Ipsilateral homonymous superior quadrantanopia
- e) Monocular visual loss

Answer

A lesion of the optic nerve will result in ipsilateral monocular visual loss.

Notes

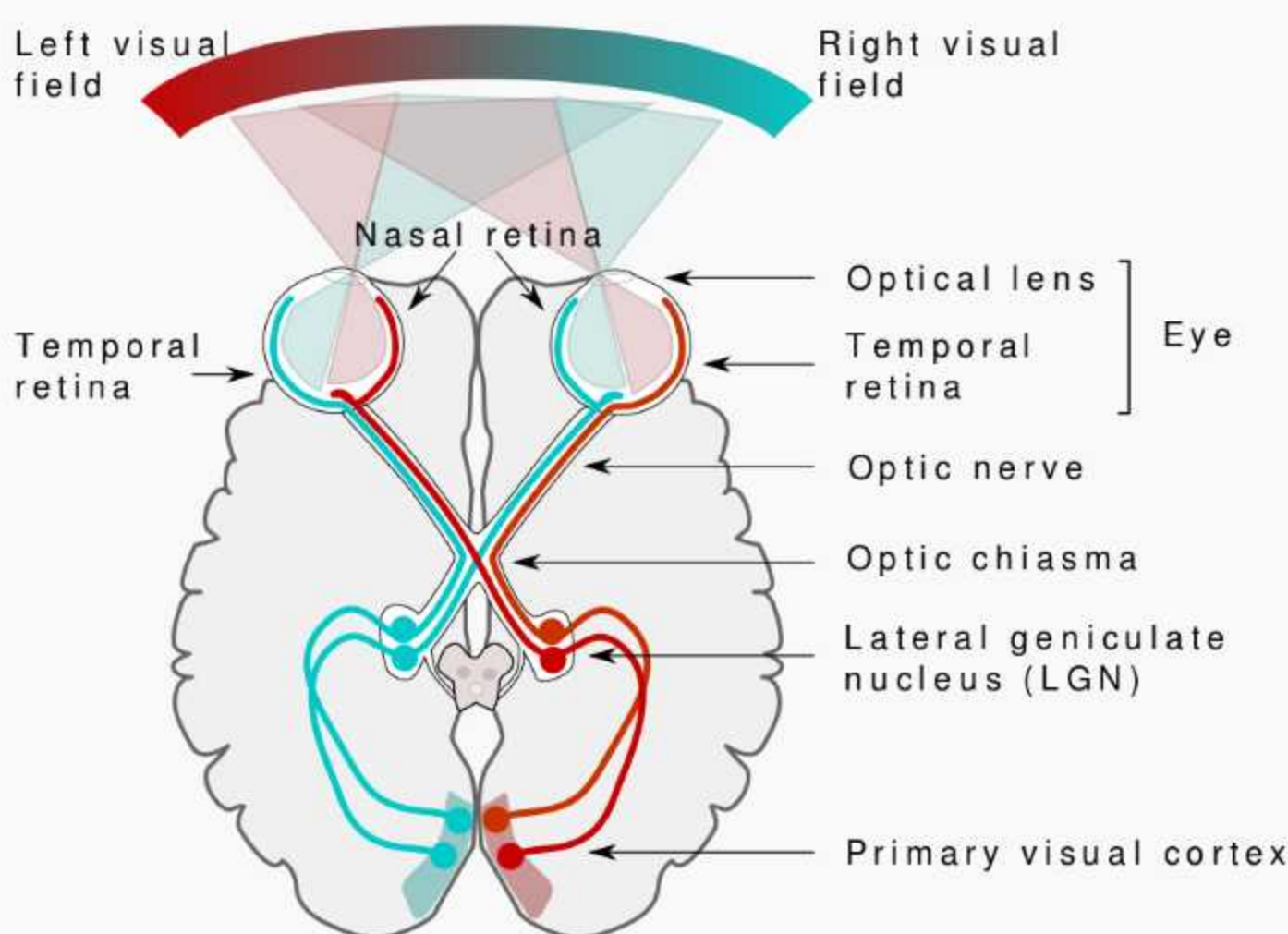
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

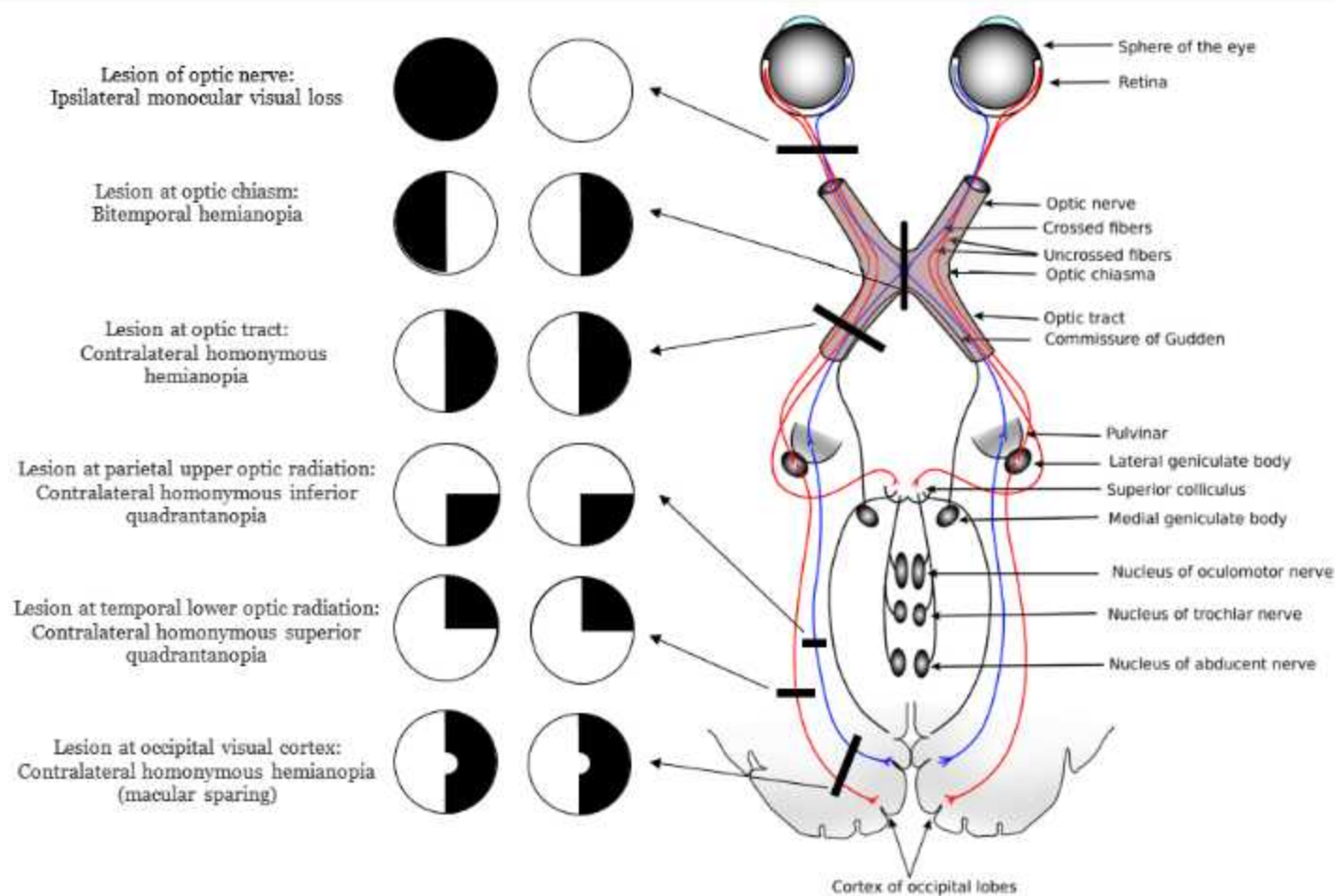
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Answered
79	Answered
80	Current Question
81	...
82	...
83	...
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 81 of 142



A 65 year old lady presents to ED complaining of visual loss. Examination demonstrates visual loss in the lower left quadrant in both visual fields. The lesion would most likely be in which of the following:

- ☐ a Left temporal lobe
- ☐ b Right temporal lobe
- ☒ c Left parietal lobe
- ☐ d Right parietal lobe
- ☐ e Right occipital lobe

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

74 Answered

75 Answered

76 Answered

77 Answered

78 Answered

79 Answered

80 Answered

81 Current Question

82 ...

83 ...

84 ...

85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 81 of 142

A 65 year old lady presents to ED complaining of visual loss. Examination demonstrates visual loss in the lower left quadrant in both visual fields. The lesion would most likely be in which of the following:

- a) Left temporal lobe
- b) Right temporal lobe
- c) Left parietal lobe
- d) Right parietal lobe
- e) Right occipital lobe

Answer

Contralateral homonymous inferior quadrantanopia results from a lesion to the upper part of the optic radiation, situated within the parietal lobe.

Notes

The parietal lobe lies between the frontal lobe anteriorly and the occipital lobe posteriorly, from which it is separated by the central sulcus and parieto-occipital sulcus, respectively. It sits superiorly in relation to the temporal lobe, being separated by the lateral sulcus.

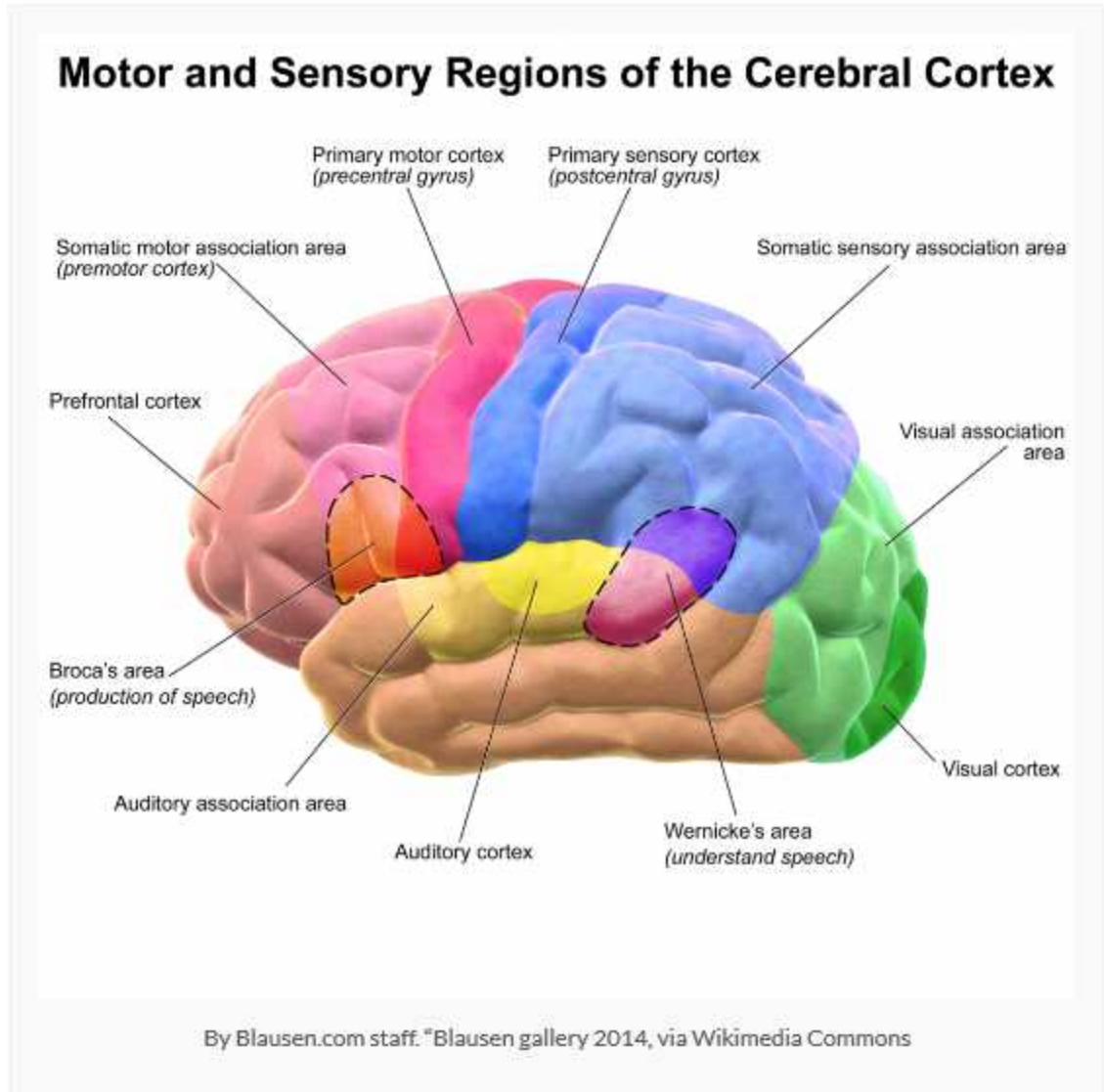
Areas of the parietal lobe are responsible for:

- Perceiving and interpreting sensation and proprioception
- Language and calculation of numbers on the dominant hemisphere side
- Integration of somatosensory, visual and auditory information and processing of visuospatial functions (e.g. 2-point discrimination) on the non-dominant hemisphere side

Area	Function	Lesion
Primary somatosensory cortex and somatosensory association cortex	Sensation and proprioception, visuo-spatial perception	Loss of sensation, difficulty distinguishing left from right, sensory neglect, apraxia, loss of hand-eye coordination, tactile agnosia
Arcuate fasciculus	Connects audiovisual association areas with Broca and Wernicke speech areas	Difficulties with reading, writing, naming, maths
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous inferior quadrantanopia

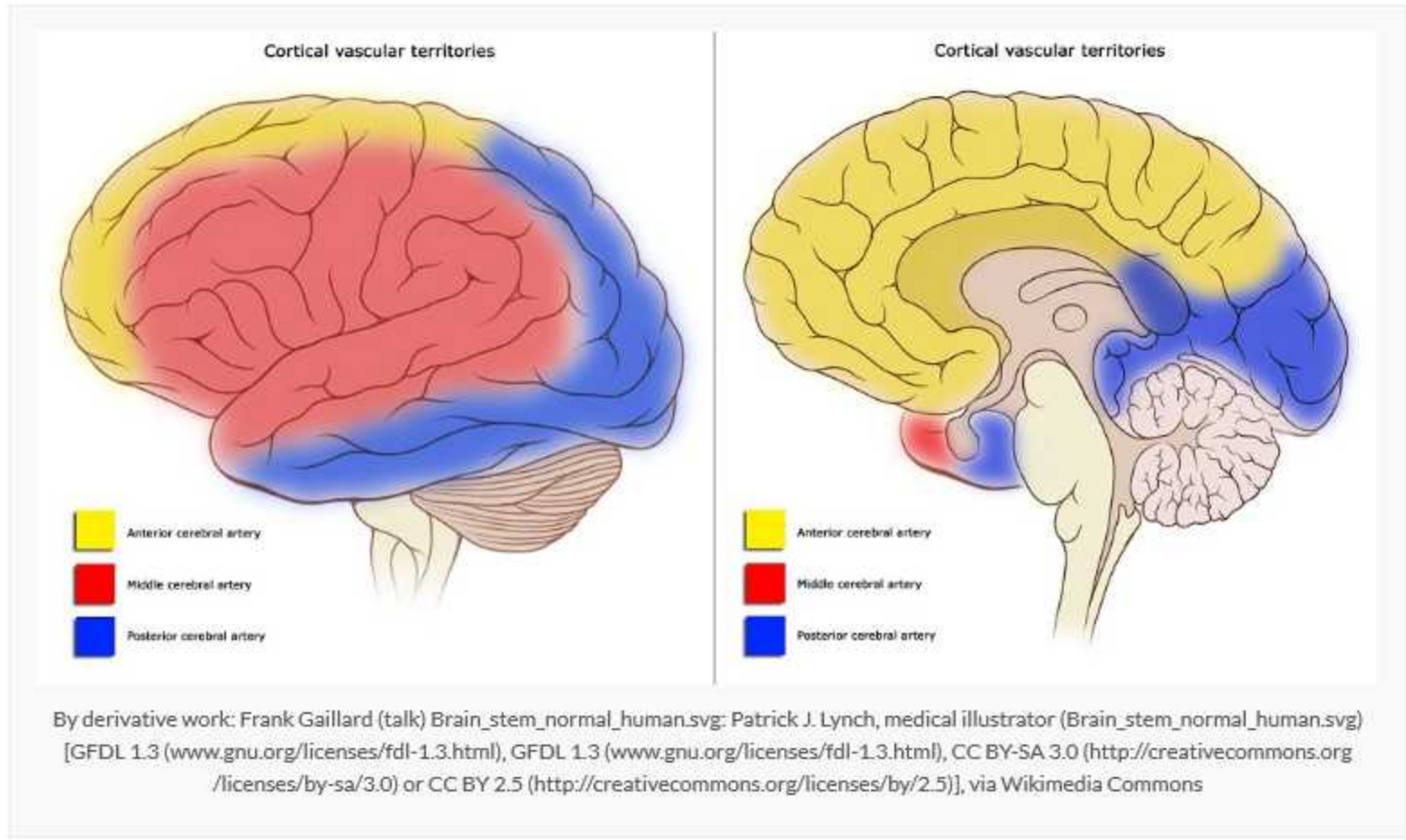
Areas of the parietal lobe

- The primary somatosensory cortex is located in the postcentral gyrus and is concerned with perceiving complex somatosensory stimuli from the contralateral side of the face and body. Together with the somatosensory association cortex, these areas are responsible for sensation and proprioception, and visuo-spatial perception.
- Pathways within the arcuate fasciculus are concerned with language as they connect Broca's area (frontal lobe) with Wernicke's area (temporal lobe).
- The fibres of the upper part of the optic radiation (serving the lower quadrant of the contralateral visual field) pass deep within the parietal lobe.



Blood supply

The blood supply to the parietal lobe is from the middle cerebral artery.



Clinical implications:

Damage to the parietal lobe may result in:

- Cortical contralateral sensory loss with loss of proprioception and two-point discrimination
- Apraxia
- Tactile agnosia
- Attention deficits e.g. contralateral hemispatial neglect syndrome (an inability to perceive a contralateral stimulus when two simultaneous sensory stimuli are applied with equal intensity to corresponding sites on opposite sides of the body)
- Visual field defect (contralateral homonymous inferior quadrantanopia)

< Previous Next >

Something wrong?

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Answered
79	Answered
80	Answered
81	Current Question
82	...
83	...
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 82 of 142



Which of the following nerves is the afferent pathway of the pupillary light reflex:

- ☐ a Ophthalmic nerve
- ☐ b Oculomotor nerve
- ☐ c Optic nerve
- ☐ d Facial nerve
- ☐ e Trochlear nerve

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Answered
- 78 Answered
- 79 Answered
- 80 Answered
- 81 Answered
- 82 Current Question
- 83 ...
- 84 ...
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 82 of 142



Which of the following nerves is the afferent pathway of the pupillary light reflex:

- a) Ophthalmic nerve
- b) Oculomotor nerve
- c) Optic nerve
- d) Facial nerve
- e) Trochlear nerve

Answer

The optic nerve is the afferent pathway of the pupillary light reflex. The oculomotor nerve is the efferent pathway of the pupillary light reflex.

Notes

The optic nerve (CN II) is a purely sensory nerve, which carries visual information from the retina to the visual cortex.

Cranial nerve	Optic nerve (CN II)
Key anatomy	Formed from convergence of axons of neurons in ganglion layer of retina, surrounded by cranial meninges, enters skull via optic canal of sphenoid bone, receives blood supply from combination of anterior cerebral, ophthalmic and central retinal arteries
Function	Sensory: vision, afferent pathway of pupillary light reflex
Assessment	Visual acuity (Snellen chart), colour vision (Ishihara plates), pupillary light response, optic disc (fundoscopy), visual fields (tests visual pathway)
Clinical effects of injury	Ipsilateral monocular visual loss, loss of colour vision, abnormal pupillary light reflex, visual field defects if damage to visual pathway
Causes of injury	Optic neuritis in multiple sclerosis, optic nerve compression in orbital cellulitis or glaucoma, optic nerve toxicity, trauma (e.g. orbital fracture, penetrating injury to eye), ischaemia secondary to vascular disease

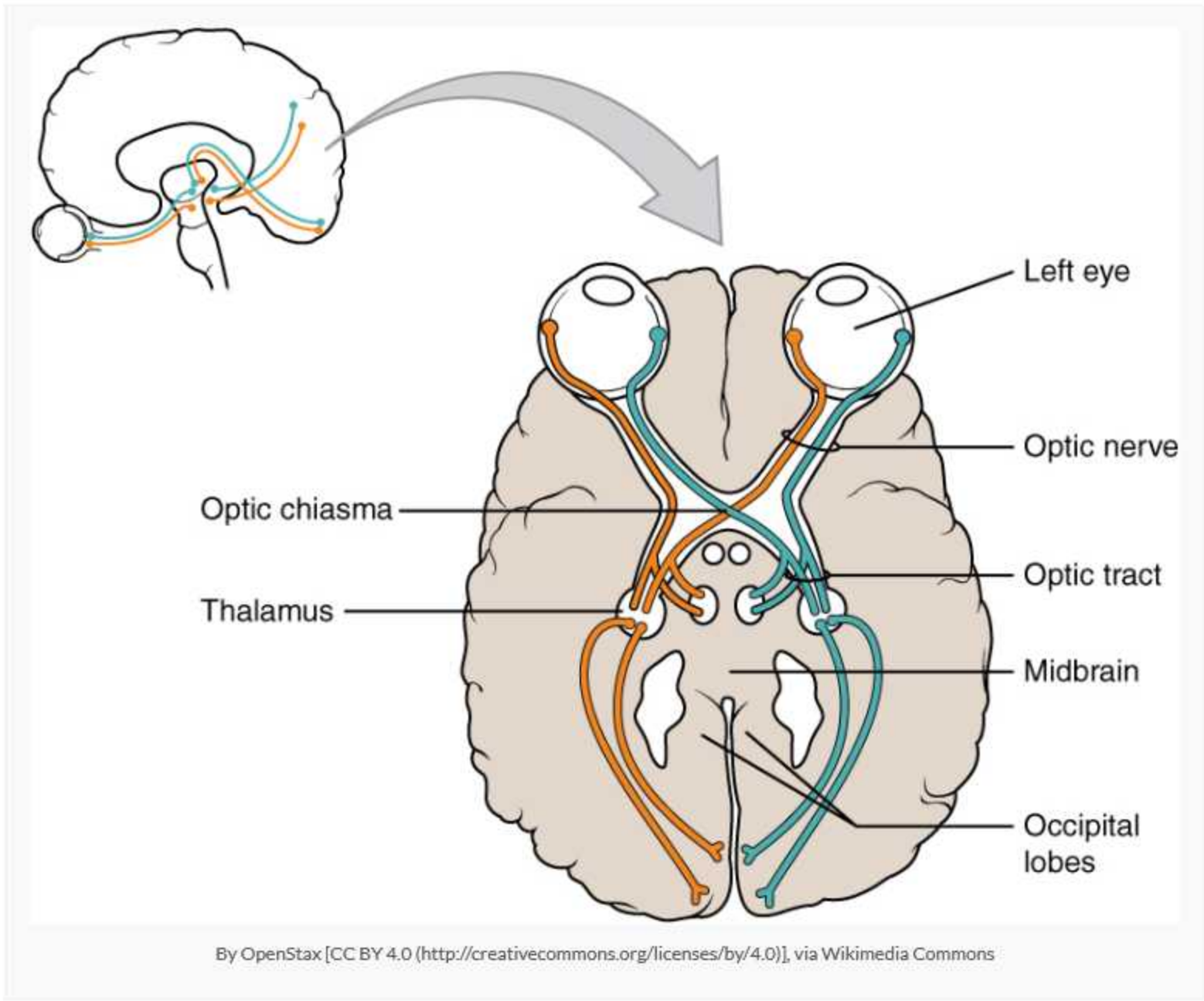
Key anatomy

The optic nerve is not a true cranial nerve but rather an extension of the brain carrying afferent fibres from the retina of the eyeball to the visual centres of the brain. It is one of two cranial nerves that do not arise from the brainstem, the other being the olfactory nerve.

The optic nerve is surrounded by the cranial meninges, including the subarachnoid space, which extend as far forwards as the eyeball. Any increase in intracranial pressure will therefore result in increased pressure in the subarachnoid space surrounding the optic nerve. This impedes venous return along the retinal veins, causing oedema of the optic disc (papilloedema).

The optic nerve leaves the orbit through the sphenoidal optic canal.

The optic nerve receives its blood supply from the anterior cerebral, ophthalmic and central retinal arteries.



Assessment

To assess the optic nerve:

- The patient should be asked if they have any problems with their vision
- Visual acuity should be assessed with a Snellen chart
- Colour vision can be assessed with Ishihara plates
- Pupillary response should be tested using a swinging light to assess direct and consensual reflexes (this tests both the afferent optic nerve and the efferent oculomotor nerve)
- Visual fields should be assessed
- The optic disc should be assessed using fundoscopy

Clinical implications

Lesions of the optic nerve result in:

- Visual loss in the ipsilateral eye
- Loss of colour vision in the ipsilateral eye
- Abnormal pupillary light reflex
 - Loss of pupillary light reflex seen in complete transection of the optic nerve:
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex lost
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex intact
 - Relative afferent pupillary defect (RAPD) seen in other optic nerve disease:
 - Paradoxical direct and consensual dilatation when light is shone in the affected eye directly after being shone in the unaffected eye (the affected eye still senses light and constricts, but to a lesser extent than when light is shone in the unaffected eye, therefore the pupils appear to dilate)

Causes of damage to the optic nerve include:

- Optic neuritis in multiple sclerosis or secondary to measles or mumps
- Optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- Optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- Optic nerve trauma secondary to orbital fracture or penetrating injury to the eye
- Optic nerve ischaemia secondary to arterial disease

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Answered
79	Answered
80	Answered
81	Answered
82	Current Question
83	...
84	...
85	...

< Previous Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 83 of 142



The glossopharyngeal nerve supplies general sensation to all of the following regions EXCEPT for:

- ☐ a Posterior one-third of the tongue
- ☐ b Palatine tonsils
- ☐ c Upper teeth and associated gingiva
- ☐ d Mucosa of the middle ear
- ☐ e Oropharynx

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Answered
- 78 Answered
- 79 Answered
- 80 Answered
- 81 Answered
- 82 Answered
- 83 Current Question
- 84 ...
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 83 of 142

The glossopharyngeal nerve supplies general sensation to all of the following regions EXCEPT for:

- a) Posterior one-third of the tongue
- b) Palatine tonsils
- c) Upper teeth and associated gingiva
- d) Mucosa of the middle ear
- e) Oropharynx

Answer

The maxillary division of the trigeminal nerve supplies general sensation to the upper teeth and associated gingivae.

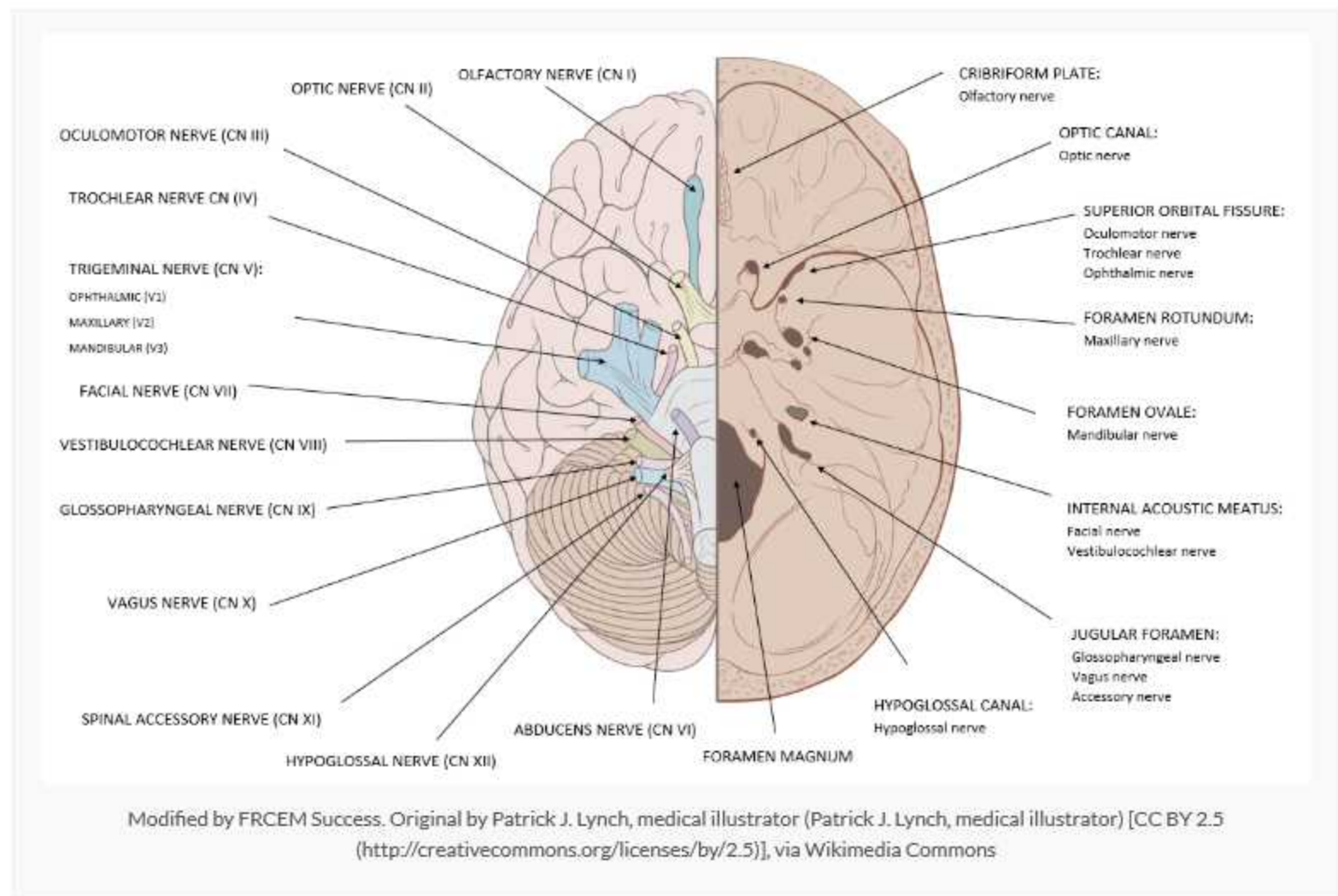
Notes

The glossopharyngeal nerve (CN IX) mediates taste, salivation and swallowing (together with CN X).

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Key anatomy

The glossopharyngeal nerve originates from the medulla and travels lateral in the posterior cranial fossa before emerging from the cranial cavity via the jugular foramen.



Function

The glossopharyngeal nerve carries:

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

Clinical implications

CN IX palsy will result in:

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

Isolated glossopharyngeal nerve palsy is rare. It is usually damaged with CN X and XI, close to the jugular foramen.

Causes of damage to CN IX include:

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Answered
79	Answered
80	Answered
81	Answered
82	Answered
83	Current Question
84	...
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 84 of 142



The mandibular division of the trigeminal nerve supplies general sensation to all of the following regions EXCEPT for the:

- ☐ a Anterior two-thirds of the tongue
- ☐ b Upper lip
- ☐ c Temple
- ☐ d External ear
- ☐ e Cranial dura mater

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 74 Answered
- 75 Answered
- 76 Answered
- 77 Answered
- 78 Answered
- 79 Answered
- 80 Answered
- 81 Answered
- 82 Answered
- 83 Answered
- 84 Current Question
- 85 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 84 of 142



- The mandibular division of the trigeminal nerve supplies general sensation to all of the following regions EXCEPT for the:
- a) Anterior two-thirds of the tongue
 - b) Upper lip
 - c) Temple
 - d) External ear
 - e) Cranial dura mater

Answer

The upper lip is supplied by branches of the maxillary division of the trigeminal nerve.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

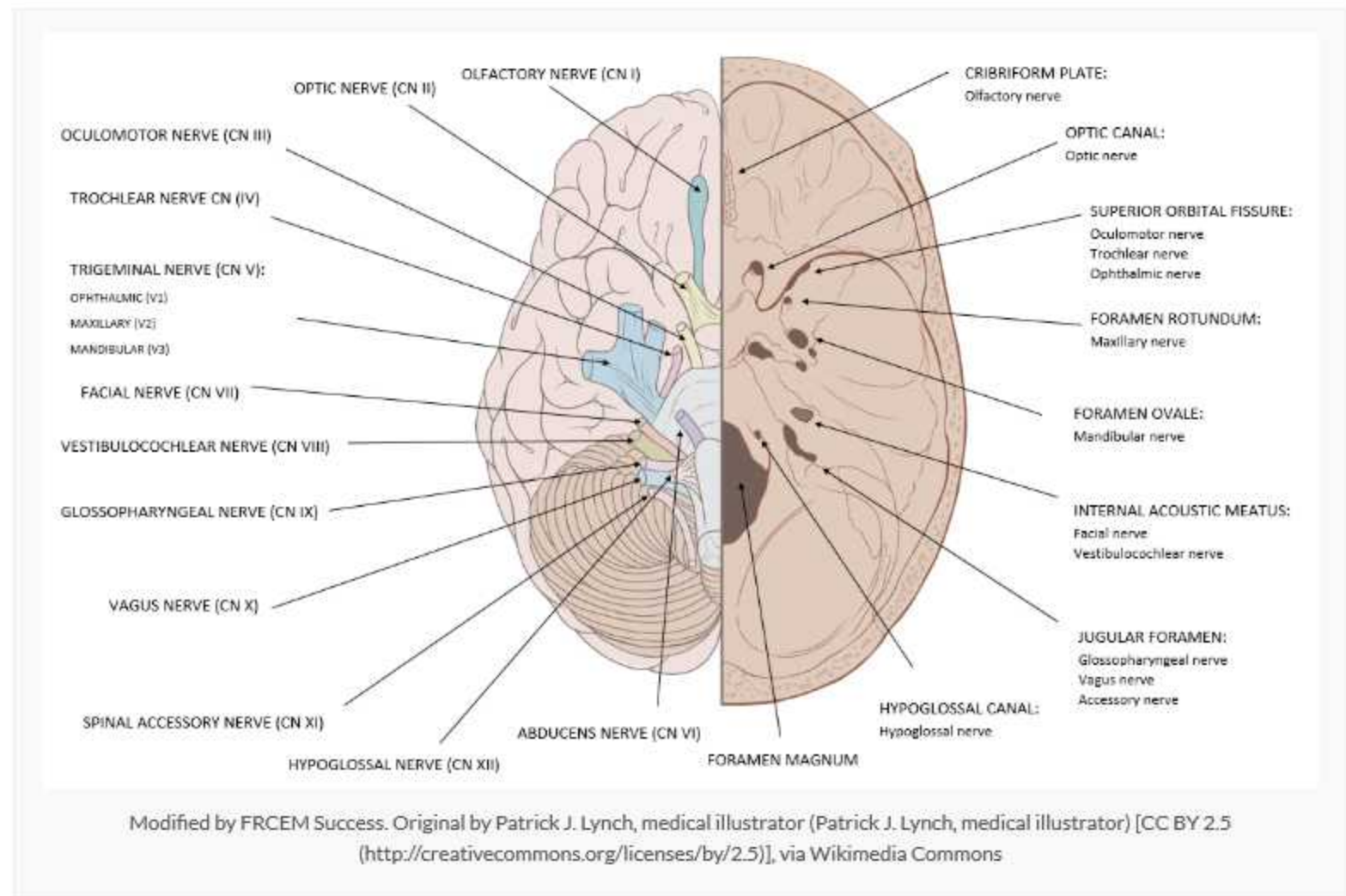
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory – innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

Question Navigator

74	Answered
75	Answered
76	Answered
77	Answered
78	Answered
79	Answered
80	Answered
81	Answered
82	Answered
83	Answered
84	Current Question
85	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 85 of 142



A 29 year old man has sustained a significant head injury. On examination it is noted that his uvula is deviated to the right. Which of the following nerves is most likely affected:

- ☐ a Right vagus nerve
- ☐ b Left vagus nerve
- ☐ c Right glossopharyngeal nerve
- ☐ d Left glossopharyngeal nerve
- ☐ e Left hypoglossal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Current Question

86 ...

87 ...

88 ...

89 ...

90 ...

91 ...

92 ...

93 ...

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 85 of 142



A 29 year old man has sustained a significant head injury. On examination it is noted that his uvula is deviated to the right. Which of the following nerves is most likely affected:

- a) Right vagus nerve
- b) Left vagus nerve
- c) Right glossopharyngeal nerve
- d) Left glossopharyngeal nerve
- e) Left hypoglossal nerve

Answer

In damage to the vagus nerve, there is paralysis of the soft palate with deviation of the uvula away from the affected side. This is because the vagus nerve innervates the musculus uvulae muscle that makes up the core of the uvula. If only one side is effectively innervated, contraction of the active muscle will pull the uvula towards it.

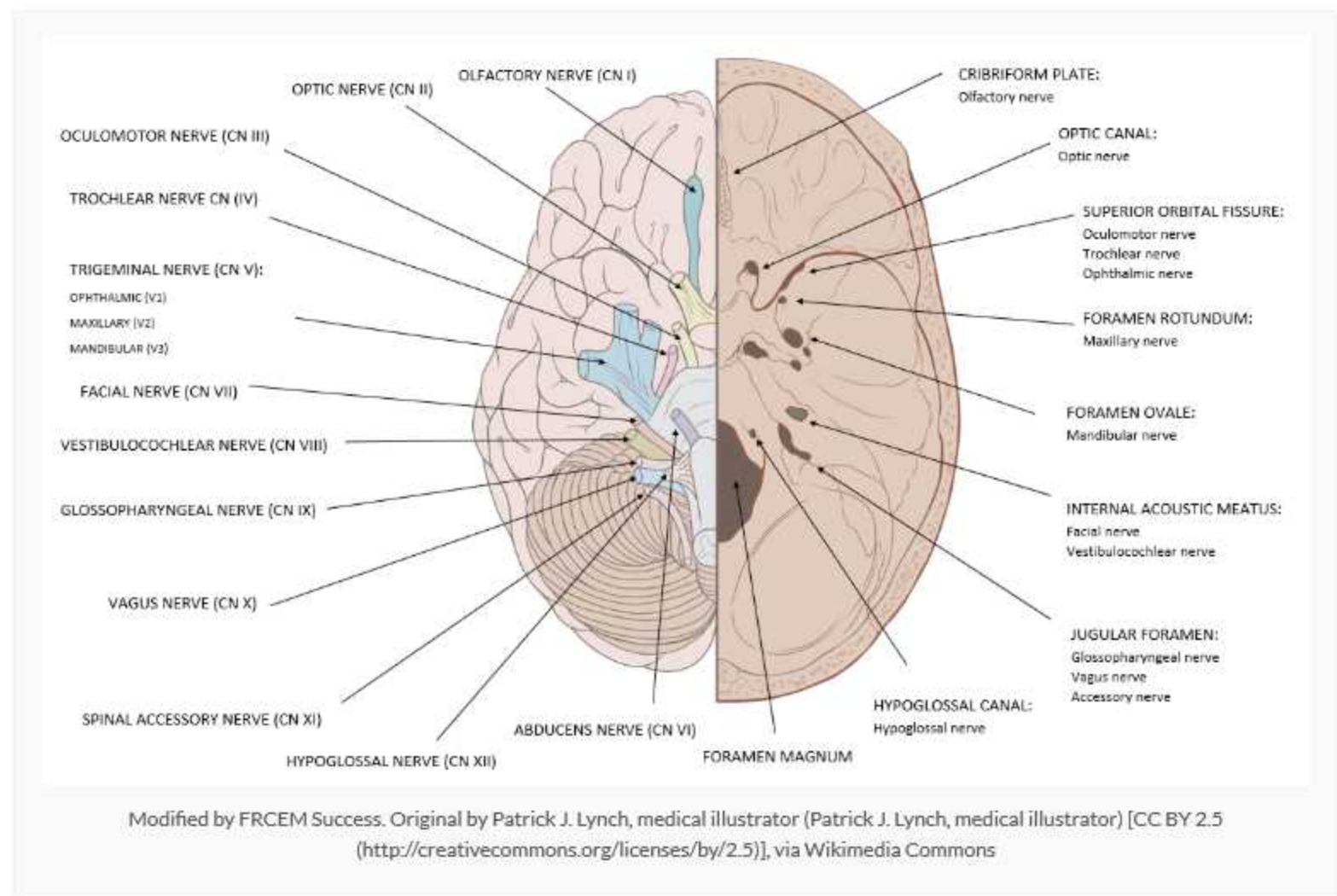
Notes

The vagus nerve (CN X) is a mixed motor and sensory nerve which mediates phonation, swallowing, elevation of the palate and taste, and innervates viscera of the neck, thorax and abdomen.

Cranial nerve	Vagus nerve (CN X)
Key anatomy	Originates in medulla, exits skull via jugular foramen, descends in neck within carotid sheath
Sensory function	Larynx, laryngopharynx, external ear, external acoustic meatus, dura mater of posterior cranial fossa, thoracic and abdominal viscera, taste around epiglottis and pharynx
Motor function	Muscles of soft palate (except tensor veli palatini) , muscles of pharynx (except stylopharyngeus), muscles of larynx, palatoglossus muscle of tongue, visceral efferent fibres to viscera of neck, thorax and abdomen, efferent pathway of gag reflex
Assessment	Ask patient to say ‘ahhh’ to look for uvular deviation, gag reflex, swallowing, speech
Clinical effects of injury	Dysarthria, dysphonia, dysphagia, stridor, loss of gag reflex, uvular deviation away from affected side
Causes of injury	Trauma, neck surgery, tumours, aneurysms, jugular foramen syndrome

Key anatomy

The vagus nerve originates in the medulla, exits the skull via the jugular foramen (with CN IX and XI), then descends in the carotid sheath to innervate the neck, chest and abdomen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The vagus nerve carries:

- General sensory afferent fibres from the larynx, laryngopharynx, deeper parts of the auricle, part of the external acoustic meatus and the dura mater of the posterior cranial fossa
- General visceral afferent fibres from the aortic body chemoreceptors and aortic arch baroreceptors, and the pharynx, larynx, oesophagus, trachea, heart and lungs and abdominal viscera as far as the mid-transverse colon
- Special afferent fibres for taste around the epiglottis and pharynx
- Parasympathetic fibres to the pharynx, larynx, thoracic viscera, and abdominal viscera as far as the mid-transverse colon
- Motor fibres to the palatoglossus muscle of the tongue, the muscles of the soft palate (except for the tensor veli palatini), the muscles of the pharynx (except the stylopharyngeus), the muscles of the larynx and the striated muscle of the upper oesophagus
- General visceral efferent fibres to the viscera of the neck and the thoracic and abdominal cavities as far as the mid-transverse colon

Clinical implications

Vagus nerve palsy results in:

- Ipsilateral palatal weakness with nasal speech and nasal regurgitation of food (the soft palate and uvular will move asymmetrically when the patient says ‘ahh’ – away from the affected side)
- Ipsilateral pharyngeal weakness with dysphagia
- Ipsilateral laryngeal weakness with hoarseness, aphonia, and stridor
- Loss of gag reflex (efferent pathway)

The vagus nerve may be damaged by:

- Trauma or neck surgery
- Lateral medullary syndrome
- Aortic aneurysms
- Tumours (mediastinal or lung carcinoma)
- Jugular foramen syndrome

Question Navigator

85	Current Question
86	...
87	...
88	...
89	...
90	...
91	...
92	...
93	...
94	...
95	...
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 86 of 142



A 49 year old presents to ED complaining of muscle weakness and clumsiness in the right hand, with slow and effortful speech. In which of the following lobes is the lesion most likely found:

- ☐ a Left frontal lobe
- ☐ b Right frontal lobe
- ☐ c Right parietal lobe
- ☐ d Left parietal lobe
- ☐ e Left temporal lobe

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Answered

86 Current Question

87 ...

88 ...

89 ...

90 ...

91 ...

92 ...

93 ...

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 86 of 142



A 49 year old presents to ED complaining of muscle weakness and clumsiness in the right hand, with slow and effortful speech. In which of the following lobes is the lesion most likely found:

- a) Left frontal lobe
- b) Right frontal lobe
- c) Right parietal lobe
- d) Left parietal lobe
- e) Left temporal lobe

Answer

The patient exhibits motor weakness and expressive dysphasia. The lesion is most likely in the left frontal lobe.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

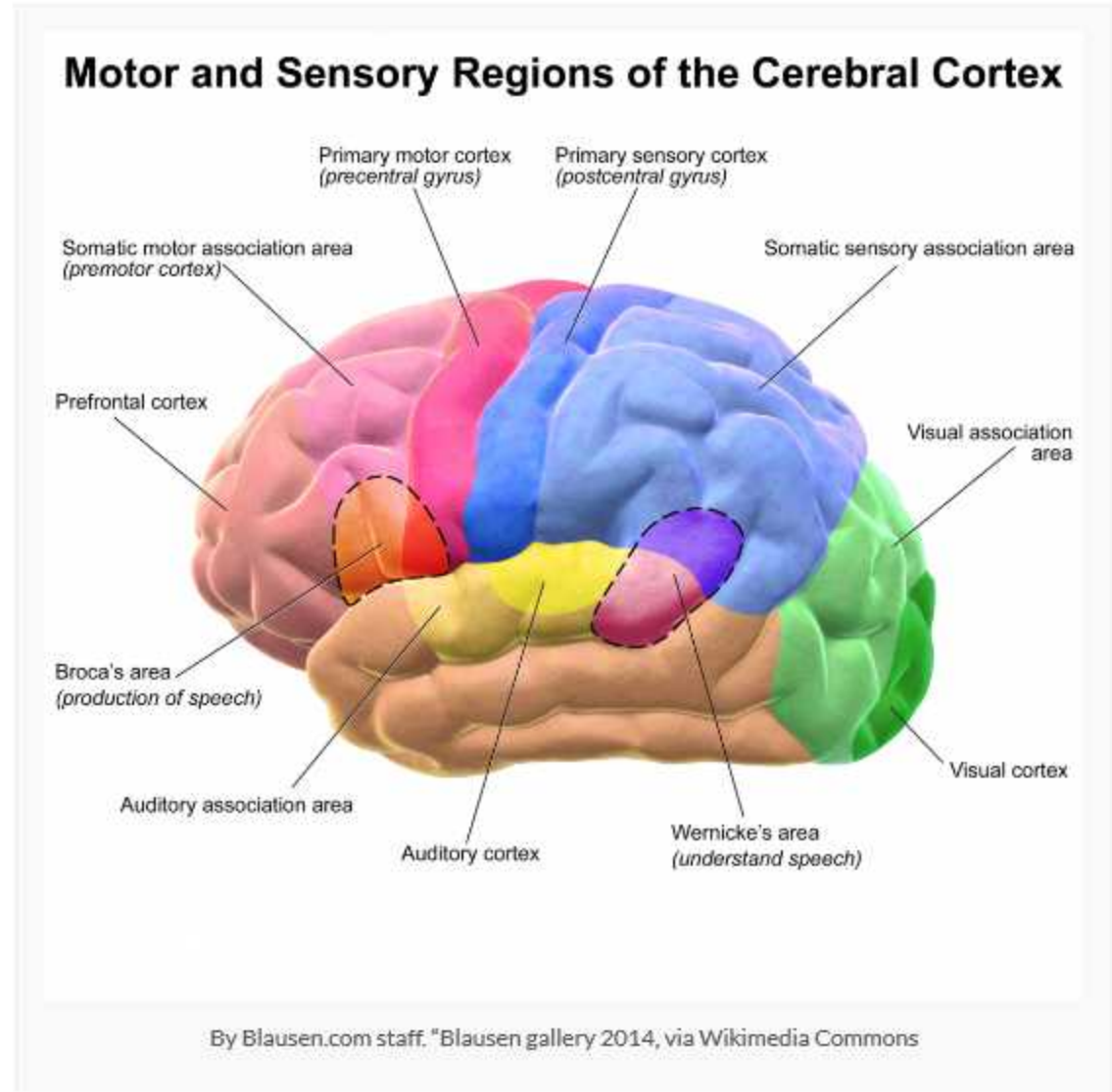
Areas of the frontal lobe are responsible for:

- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

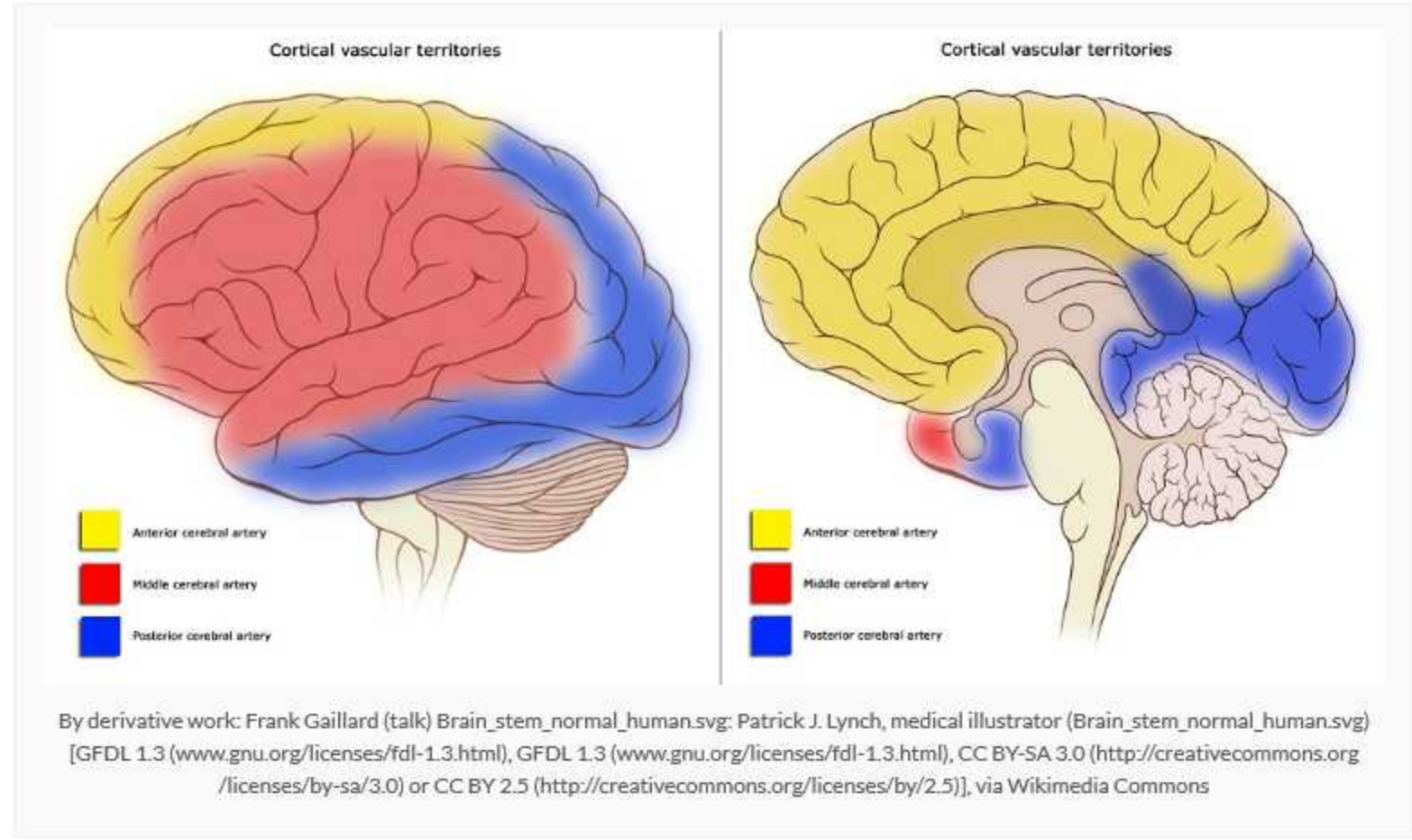
Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.



Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

Question Navigator

85	Answered
86	Current Question
87	...
88	...
89	...
90	...
91	...
92	...
93	...
94	...
95	...
96	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 87 of 142



What type of visual field defect are you most likely to see in a lesion of the optic tract:

- ☐ a Bitemporal hemianopia
- ☐ b Contralateral homonymous inferior quadrantanopia
- ☐ c Contralateral homonymous hemianopia
- ☐ d Contralateral homonymous superior quadrantanopia
- ☐ e Homonymous hemianopia with macular sparing

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Answered

86 Answered

87 Current Question

88 ...

89 ...

90 ...

91 ...

92 ...

93 ...

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 87 of 142

What type of visual field defect are you most likely to see in a lesion of the optic tract:

- a) Bitemporal hemianopia
- b) Contralateral homonymous inferior quadrantanopia
- c) Contralateral homonymous hemianopia
- d) Contralateral homonymous superior quadrantanopia
- e) Homonymous hemianopia with macular sparing

Answer

A lesion of the optic tract will result in a contralateral homonymous hemianopia.

Notes

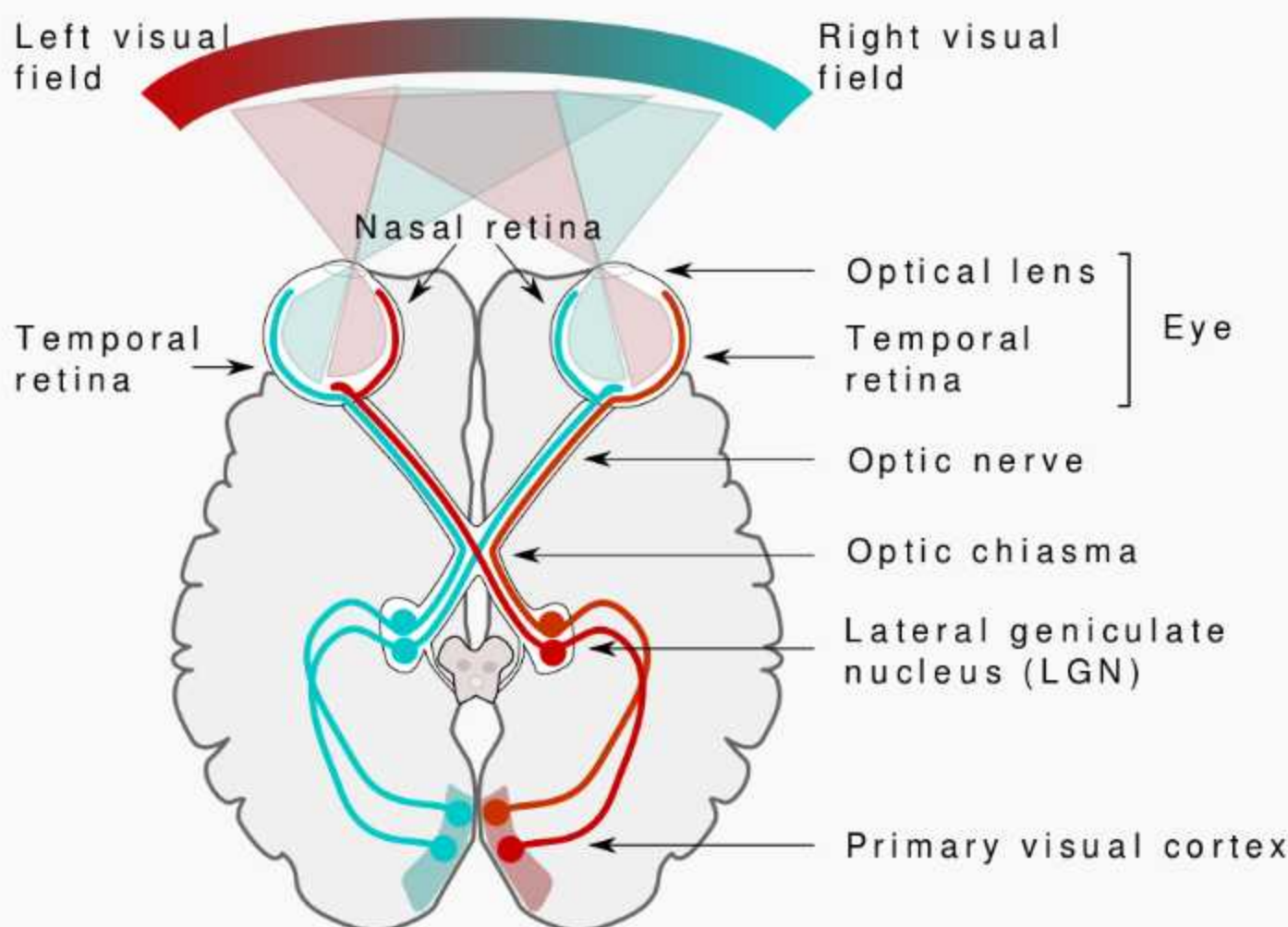
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

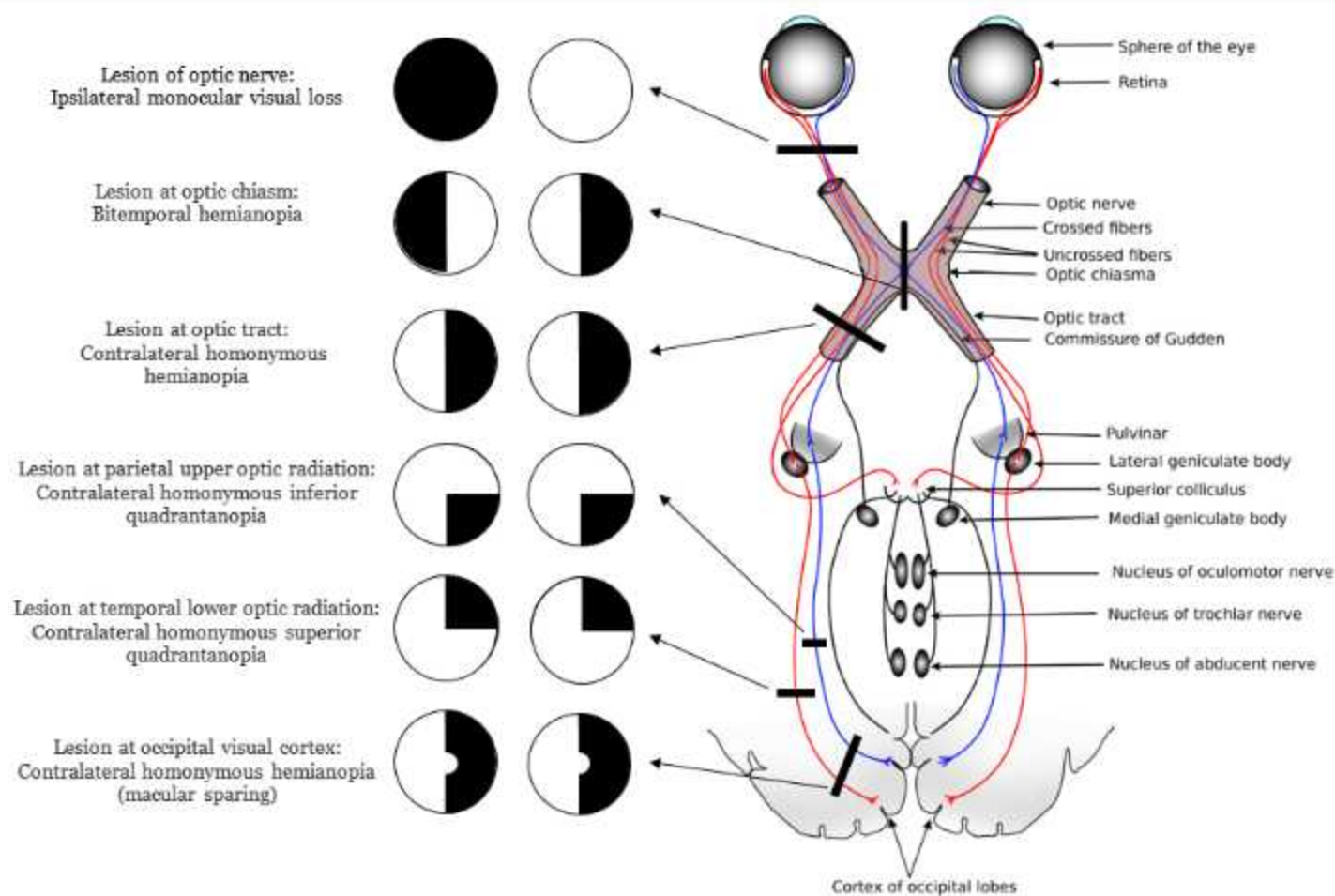
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

Question Navigator

85	Answered
86	Answered
87	Current Question
88	...
89	...
90	...
91	...
92	...
93	...
94	...
95	...
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 88 of 142



Which of the following clinical features would you least expect to see in a lesion of the frontal lobe:

- ☐ a Primitive reflexes
- ☐ b Spastic paralysis of the contralateral leg
- ☐ c Contralateral homonymous hemianopia with macular sparing
- ☐ d Incontinence
- ☐ e Inability to problem solve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Answered

86 Answered

87 Answered

88 Current Question

89 ...

90 ...

91 ...

92 ...

93 ...

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 88 of 142



Which of the following clinical features would you least expect to see in a lesion of the frontal lobe:

- a) Primitive reflexes
- b) Spastic paralysis of the contralateral leg
- c) Contralateral homonymous hemianopia with macular sparing
- d) Incontinence
- e) Inability to problem solve

Answer

Contralateral homonymous hemianopia with macular sparing results from damage to the primary visual cortex of the occipital lobe. Incontinence may occur due to damage of the cortical micturition centre in the prefrontal cortex. Primitive reflexes and inability to problem solve may occur due to damage to the prefrontal cortex. Motor weakness of the contralateral limb with UMN signs may occur due to damage of the primary motor cortex.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

Areas of the frontal lobe are responsible for:

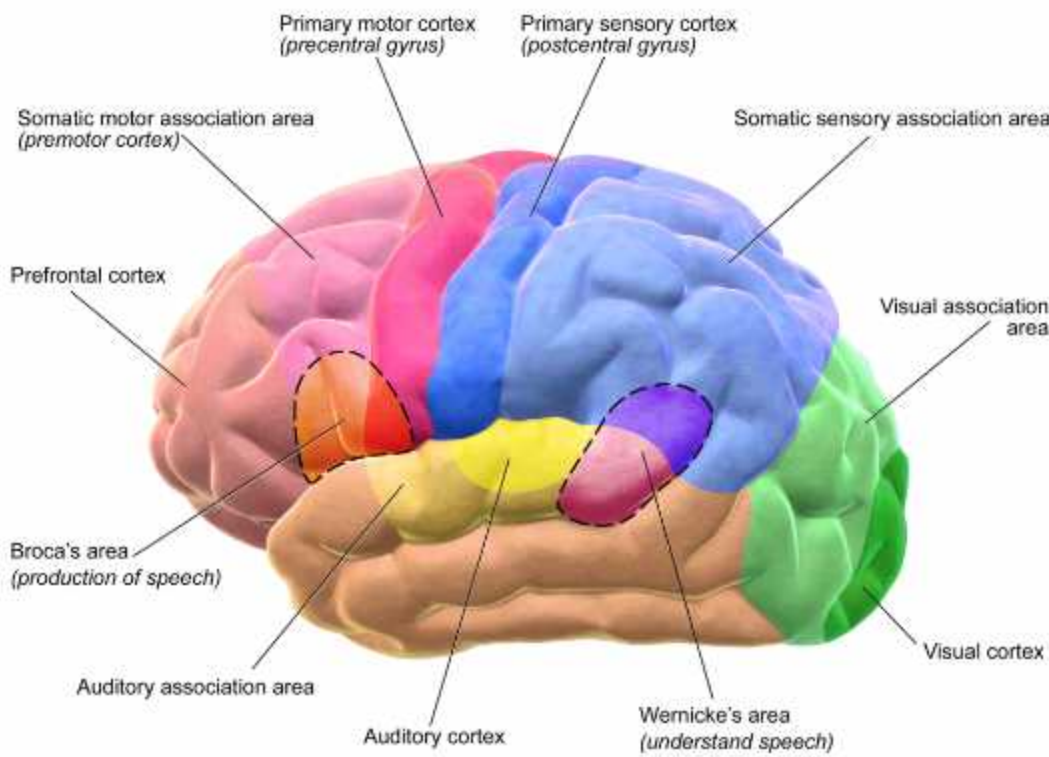
- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.

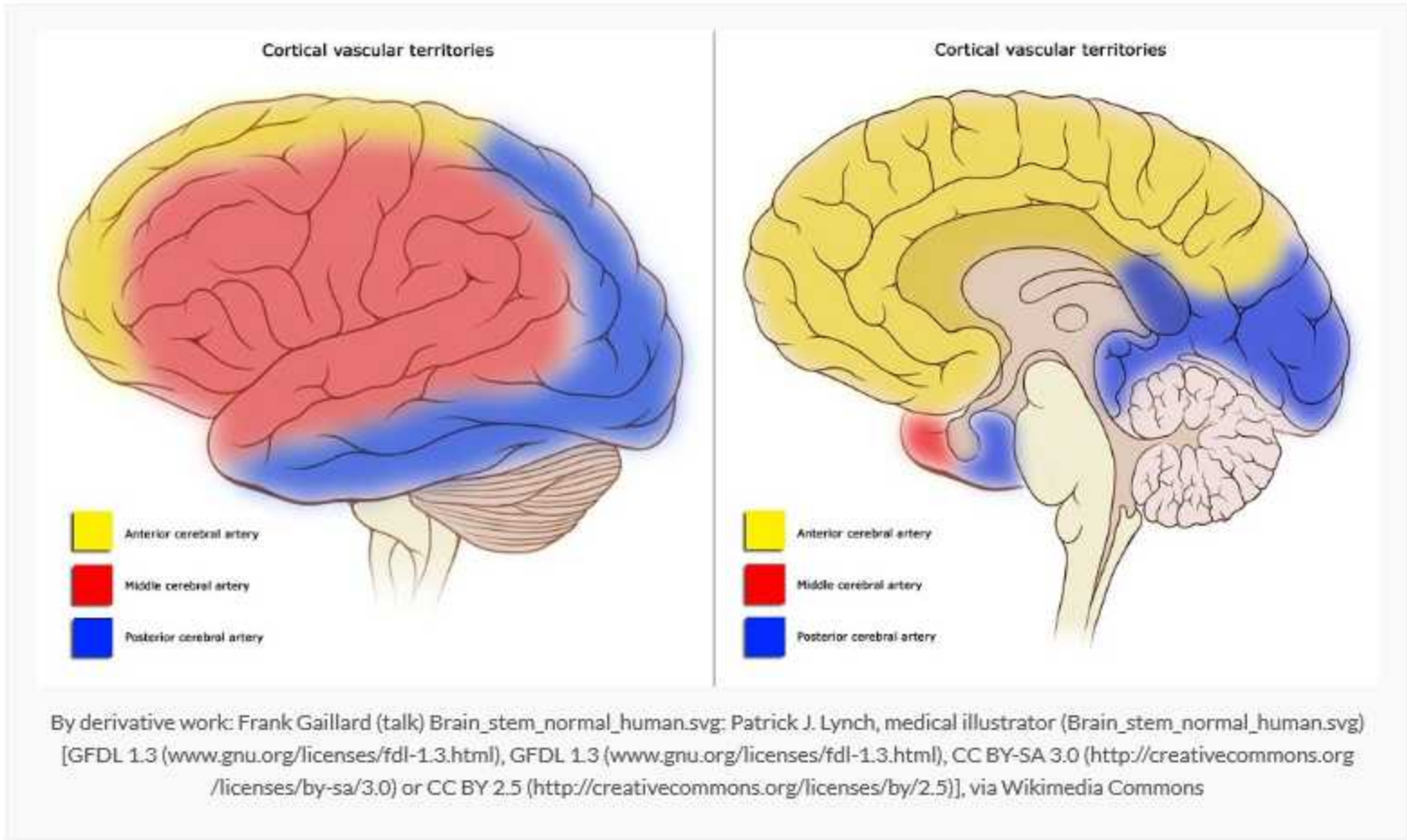
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

< Previous

Next >

Something wrong?

Question Navigator

85	Answered
86	Answered
87	Answered
88	Current Question
89	...
90	...
91	...
92	...
93	...
94	...
95	...
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and intermediate exam preparation.

Terms & Conditions
Get In Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 89 of 142



A 49 year old man presents to ED complaining of visual disturbance in his right eye. On examination you note when you shine a light in his right eye, neither his right or left pupil constricts. When you shine a light in his left eye, both his left and right pupil constrict. Which of the following nerves is most likely affected:

- ☐ a Oculomotor nerve
- ☐ b Optic nerve
- ☐ c Trochlear nerve
- ☐ d Abducens nerve
- ☐ e Ophthalmic nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 85 Answered
- 86 Answered
- 87 Answered
- 88 Answered
- 89 Current Question
- 90 ...
- 91 ...
- 92 ...
- 93 ...
- 94 ...
- 95 ...
- 96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 89 of 142



A 49 year old man presents to ED complaining of visual disturbance in his right eye. On examination you note when you shine a light in his right eye, neither his right or left pupil constricts. When you shine a light in his left eye, both his left and right pupil constrict. Which of the following nerves is most likely affected:

- a) Oculomotor nerve
- b) **Optic nerve** ✓
- c) Trochlear nerve
- d) Abducens nerve
- e) Ophthalmic nerve

Answer

Loss of the afferent pupillary light reflex is seen in complete palsy of the optic nerve. The ipsilateral direct and contralateral consensual reflexes are lost as the afferent optic nerve does not sense the light shone in the affected eye but the contralateral direct and ipsilateral consensual reflexes are intact as the efferent oculomotor nerve is normal.

Notes

The optic nerve (CN II) is a purely sensory nerve, which carries visual information from the retina to the visual cortex.

Cranial nerve	Optic nerve (CN II)
Key anatomy	Formed from convergence of axons of neurons in ganglion layer of retina, surrounded by cranial meninges, enters skull via optic canal of sphenoid bone, receives blood supply from combination of anterior cerebral, ophthalmic and central retinal arteries
Function	Sensory: vision, afferent pathway of pupillary light reflex
Assessment	Visual acuity (Snellen chart), colour vision (Ishihara plates), pupillary light response, optic disc (fundoscopy), visual fields (tests visual pathway)
Clinical effects of injury	Ipsilateral monocular visual loss, loss of colour vision, abnormal pupillary light reflex, visual field defects if damage to visual pathway
Causes of injury	Optic neuritis in multiple sclerosis, optic nerve compression in orbital cellulitis or glaucoma, optic nerve toxicity, trauma (e.g. orbital fracture, penetrating injury to eye), ischaemia secondary to vascular disease

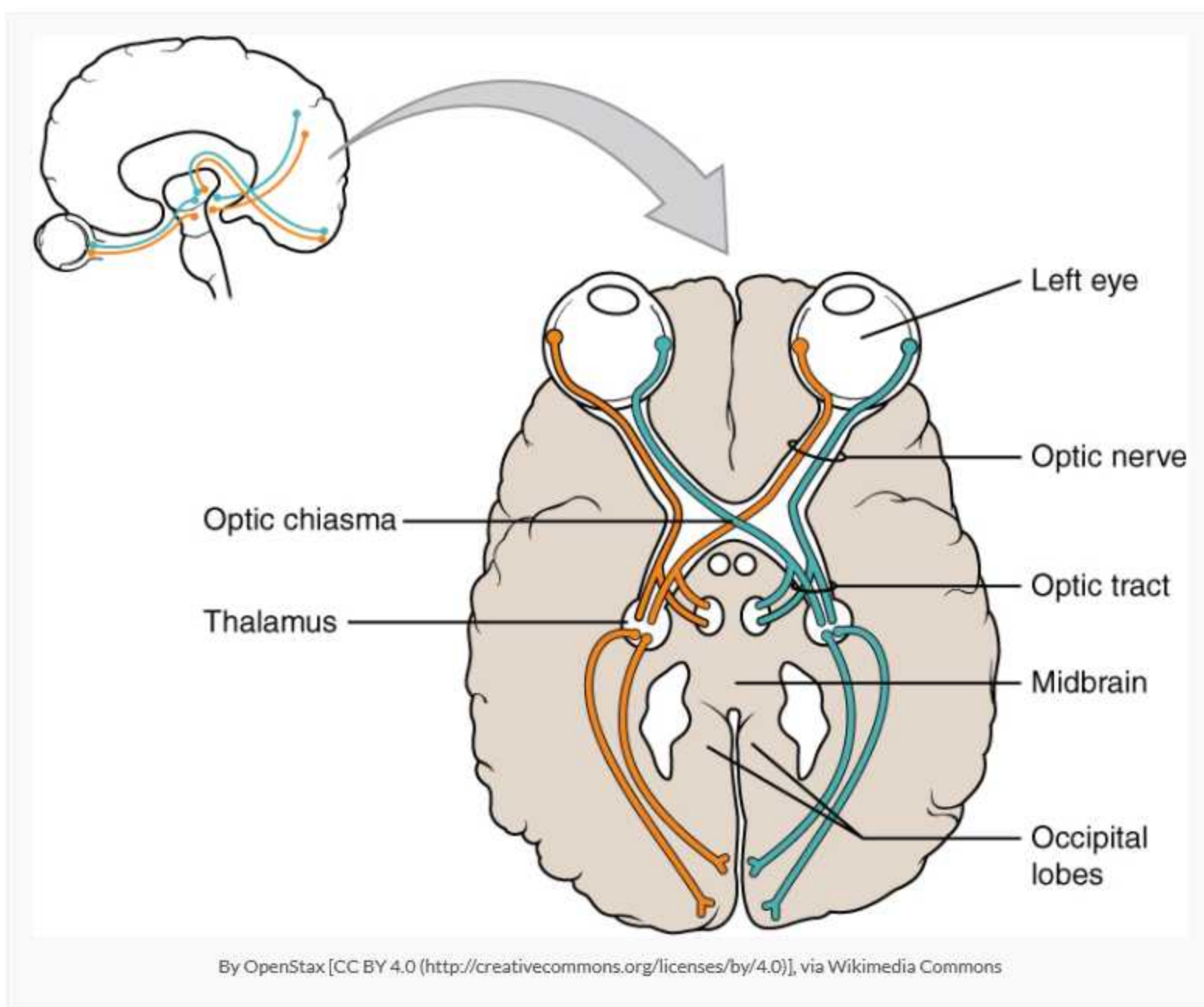
Key anatomy

The optic nerve is not a true cranial nerve but rather an extension of the brain carrying afferent fibres from the retina of the eyeball to the visual centres of the brain. It is one of two cranial nerves that do not arise from the brainstem, the other being the olfactory nerve.

The optic nerve is surrounded by the cranial meninges, including the subarachnoid space, which extend as far forwards as the eyeball. Any increase in intracranial pressure will therefore result in increased pressure in the subarachnoid space surrounding the optic nerve. This impedes venous return along the retinal veins, causing oedema of the optic disc (papilloedema).

The optic nerve leaves the orbit through the sphenoidal optic canal.

The optic nerve receives its blood supply from the anterior cerebral, ophthalmic and central retinal arteries.



Assessment

To assess the optic nerve:

- The patient should be asked if they have any problems with their vision
- Visual acuity should be assessed with a Snellen chart
- Colour vision can be assessed with Ishihara plates
- Pupillary response should be tested using a swinging light to assess direct and consensual reflexes (this tests both the afferent optic nerve and the efferent oculomotor nerve)
- Visual fields should be assessed
- The optic disc should be assessed using fundoscopy

Clinical implications

Lesions of the optic nerve result in:

- Visual loss in the ipsilateral eye
- Loss of colour vision in the ipsilateral eye
- Abnormal pupillary light reflex
 - Loss of pupillary light reflex seen in complete transection of the optic nerve:
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex lost
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex intact
 - Relative afferent pupillary defect (RAPD) seen in other optic nerve disease:
 - Paradoxical direct and consensual dilatation when light is shone in the affected eye directly after being shone in the unaffected eye (the affected eye still senses light and constricts, but to a lesser extent than when light is shone in the unaffected eye, therefore the pupils appear to dilate)

Causes of damage to the optic nerve include:

- Optic neuritis in multiple sclerosis or secondary to measles or mumps
- Optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- Optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- Optic nerve trauma secondary to orbital fracture or penetrating injury to the eye
- Optic nerve ischaemia secondary to arterial disease

Question Navigator

85	Answered
86	Answered
87	Answered
88	Answered
89	Current Question
90	...
91	...
92	...
93	...
94	...
95	...
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 90 of 142



A 65 year old lady presents to ED complaining of sudden onset visual loss. On examination, you demonstrate visual loss on the right side of the vertical midline in both eyes. Which of the following blood vessels is most likely occluded:

- ☐ a Posterior communicating artery
- ☐ b Posterior inferior cerebellar artery
- ☐ c Posterior cerebral artery
- ☐ d Anterior cerebral artery
- ☐ e Middle cerebral artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 85 Answered
- 86 Answered
- 87 Answered
- 88 Answered
- 89 Answered
- 90 Current Question
- 91 ...
- 92 ...
- 93 ...
- 94 ...
- 95 ...
- 96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 90 of 142



A 65 year old lady presents to ED complaining of sudden onset visual loss. On examination, you demonstrate visual loss on the right side of the vertical midline in both eyes. Which of the following blood vessels is most likely occluded:

- a) Posterior communicating artery
- b) Posterior inferior cerebellar artery
- c) Posterior cerebral artery
- d) Anterior cerebral artery
- e) Middle cerebral artery

Answer

The posterior cerebral artery supplies blood to the visual cortex in the occipital lobe. A lesion to this area will result in a contralateral homonymous hemianopia.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

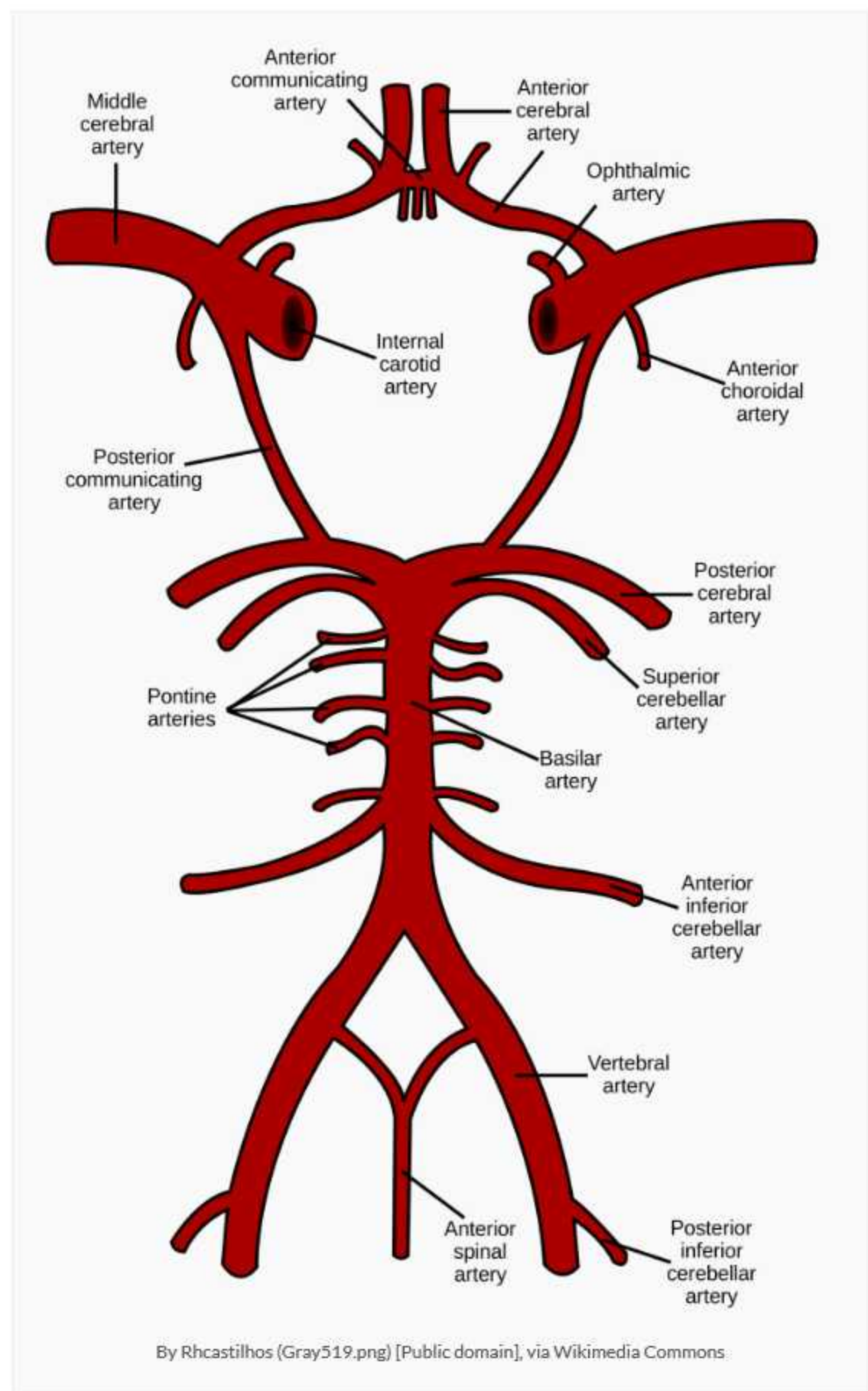
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebral artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

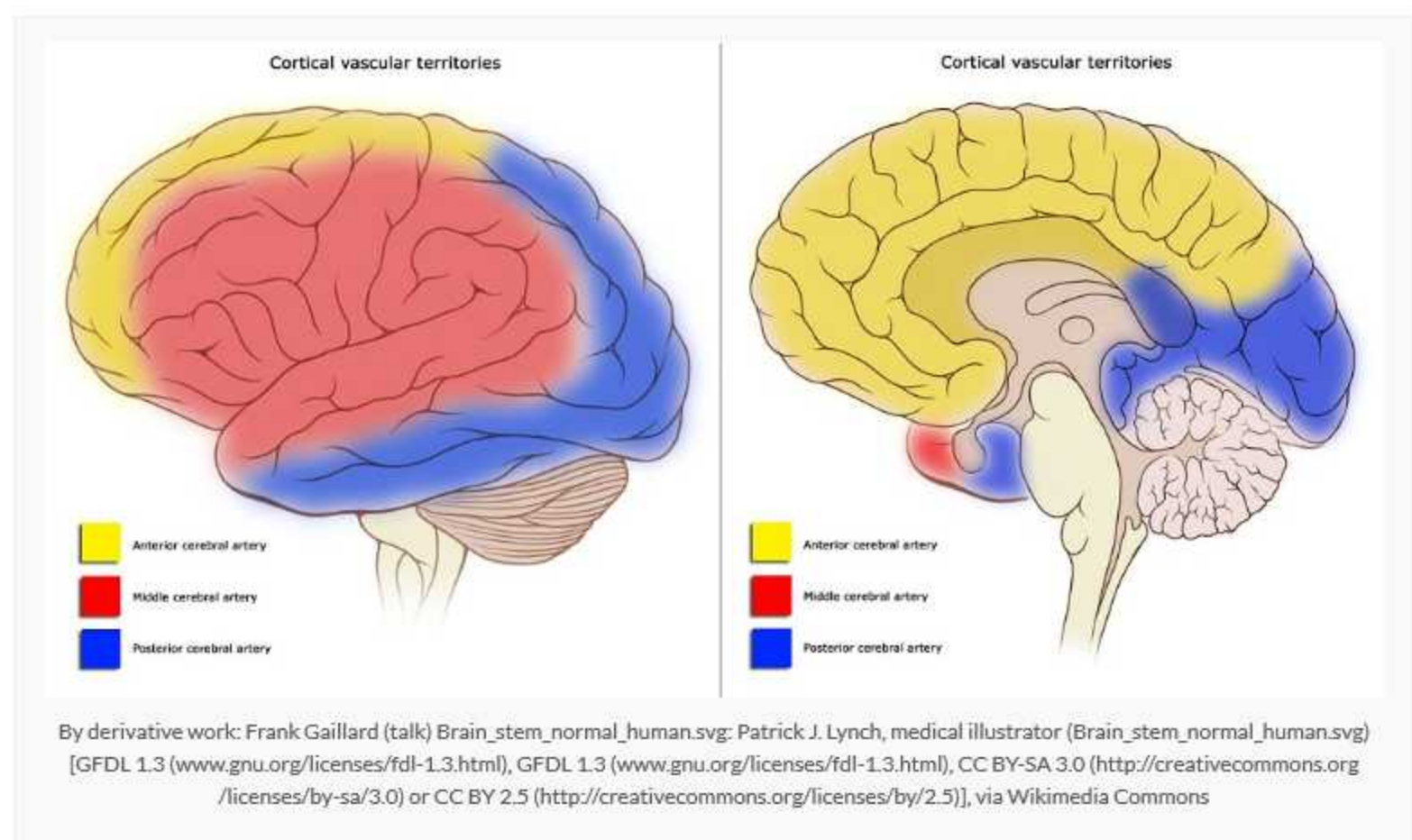
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change• PARIETAL LOBE: contralateral somatosensory loss in the lower limb• CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood• TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia• PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia• N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none">• OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral)• TEMPORAL LOBE: confusion, memory deficit• OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



Question Navigator

85	Answered
86	Answered
87	Answered
88	Answered
89	Answered
90	Current Question
91	...
92	...
93	...
94	...
95	...
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get In Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 91 of 142



A patient complains of diplopia on reading or walking downstairs, which of the following cranial nerves is most likely to be affected:

- ☐ a Trochlear nerve
- ☐ b Abducens nerve
- ☐ c Oculomotor nerve
- ☐ d Optic nerve
- ☐ e Ophthalmic division of the trigeminal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Answered

86 Answered

87 Answered

88 Answered

89 Answered

90 Answered

91 Current Question

92 ...

93 ...

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 91 of 142



- A patient complains of diplopia on reading or walking downstairs, which of the following cranial nerves is most likely to be affected:
- a) Trochlear nerve
 - b) Abducens nerve
 - c) Oculomotor nerve
 - d) Optic nerve
 - e) Ophthalmic division of the trigeminal nerve

Answer

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

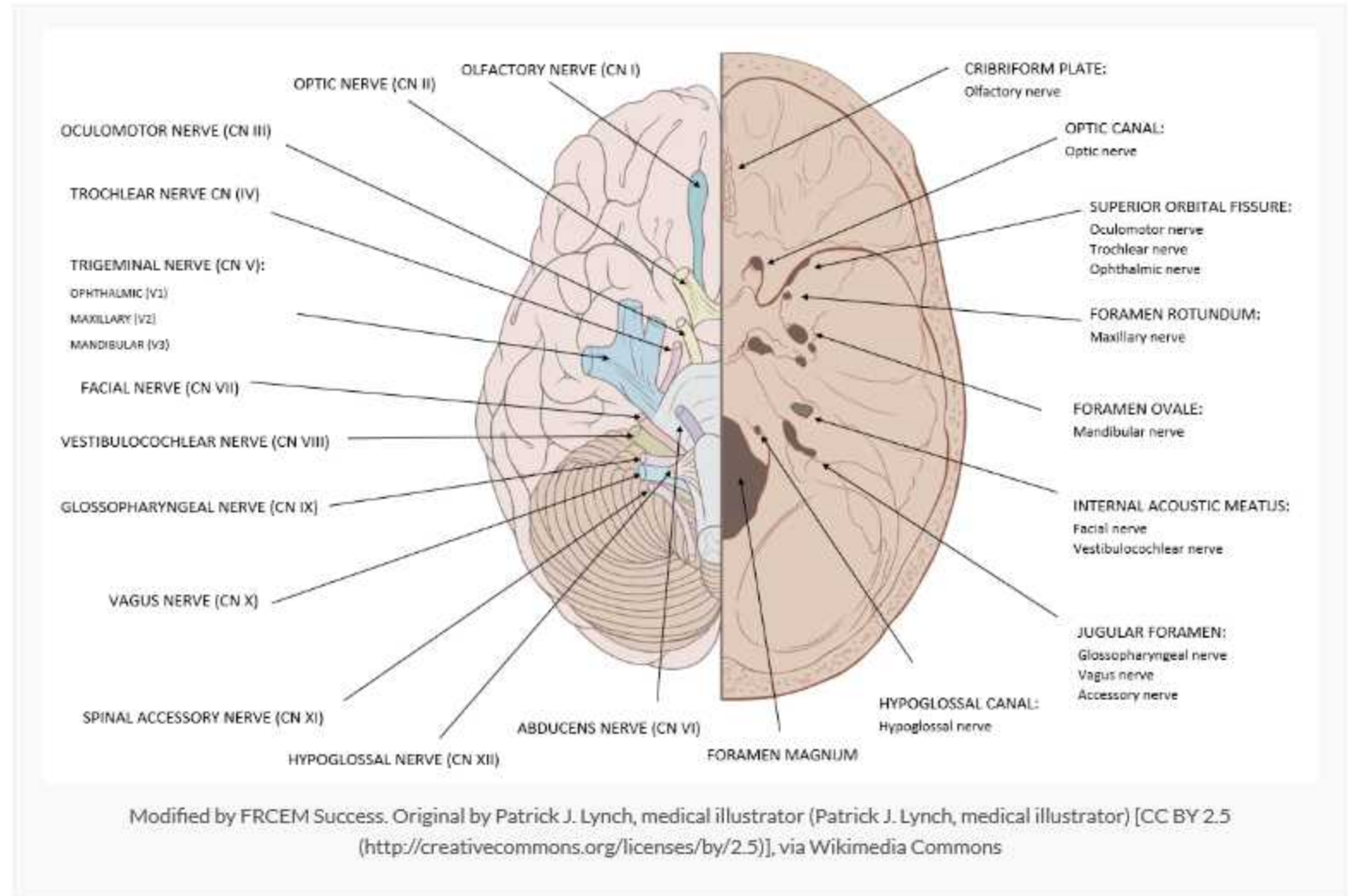
Notes

The trochlear nerve (CN IV) is a motor nerve supplying the superior oblique muscle of the eye.

Cranial nerve	Trochlear nerve (CN IV)
Key anatomy	Arises from midbrain, travels through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: superior oblique muscle of eye (intorsion, depression and abduction of eye)
Assessment	Eye movements
Clinical effects of injury	Weakness of downward gaze (difficulty reading/walking downstairs), vertical diplopia, eye is extorted and may be elevated (patient head tilts to opposite side to compensate)
Causes of injury	Idiopathic, trauma, microvasculopathy, cavernous sinus disease, raised intracranial pressure

Anatomical course

It is the smallest cranial nerve but has the longest cranial course. It arises from the trochlear nucleus and decussates within the midbrain, emerging from the posterior aspect of the midbrain. It runs anteroinferiorly within the subarachnoid space before piercing the dura and travelling along the lateral wall of the cavernous sinus, before entering the orbit of the eye via the superior orbital fissure.



Function

The superior oblique primarily rotates the top of the eye towards the nose (intorsion). Secondly, it moves the eye downward (depression) and outward (abduction). It prevents the unopposed action of the superior rectus which would otherwise rotate the globe.

Clinical implications

Trochlear palsy causes weakness of downward gaze. The patient complains of difficulty reading or walking downstairs and of vertical diplopia. The eye is extorted and may be elevated and the patient may head tilt to the opposite side of the palsy to compensate.

Causes of damage include:

- Idiopathic (most commonly)
- Trauma
- Microvasculopathy (associated with diabetes and hypertension)
- Multiple sclerosis
- Lesions in the midbrain
- Cavernous sinus disease
- Raised intracranial pressure

Question Navigator

85	Answered
86	Answered
87	Answered
88	Answered
89	Answered
90	Answered
91	Current Question
92	...
93	...
94	...
95	...
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 92 of 142



The lingual nerve supplies which of the following:

- ☐ a Taste from the anterior two-thirds of the tongue
- ☐ b Sensation from the lower lip
- ☐ c Sensation from the anterior two-thirds of the tongue
- ☐ d Sensation from the upper teeth and associated gingiva
- ☐ e Tensor veli palatini muscle

< Previous

Next >

See Answer

Something wrong?

Question Navigator

85 Answered

86 Answered

87 Answered

88 Answered

89 Answered

90 Answered

91 Answered

92 Current Question

93 ...

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 92 of 142

The lingual nerve supplies which of the following:

- a) Taste from the anterior two-thirds of the tongue
- b) Sensation from the lower lip
- c) Sensation from the anterior two-thirds of the tongue
- d) Sensation from the upper teeth and associated gingiva
- e) Tensor veli palatini muscle

Answer

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

Notes

The mandibular nerve is the largest of the three divisions of the trigeminal nerve, and unlike the other two divisions, it is both motor and sensory.

Nerve	Mandibular nerve (V3)
Key anatomy	Arises in middle cranial fossa, exits skull through foramen ovale, enters infratemporal fossa
Sensory function	Lower lip and chin, lower teeth and gingivae, floor of oral cavity, anterior two-thirds of tongue, temple, TMJ, external ear and external auditory meatus
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric
Special function	Postganglionic parasympathetic fibres to parotid gland

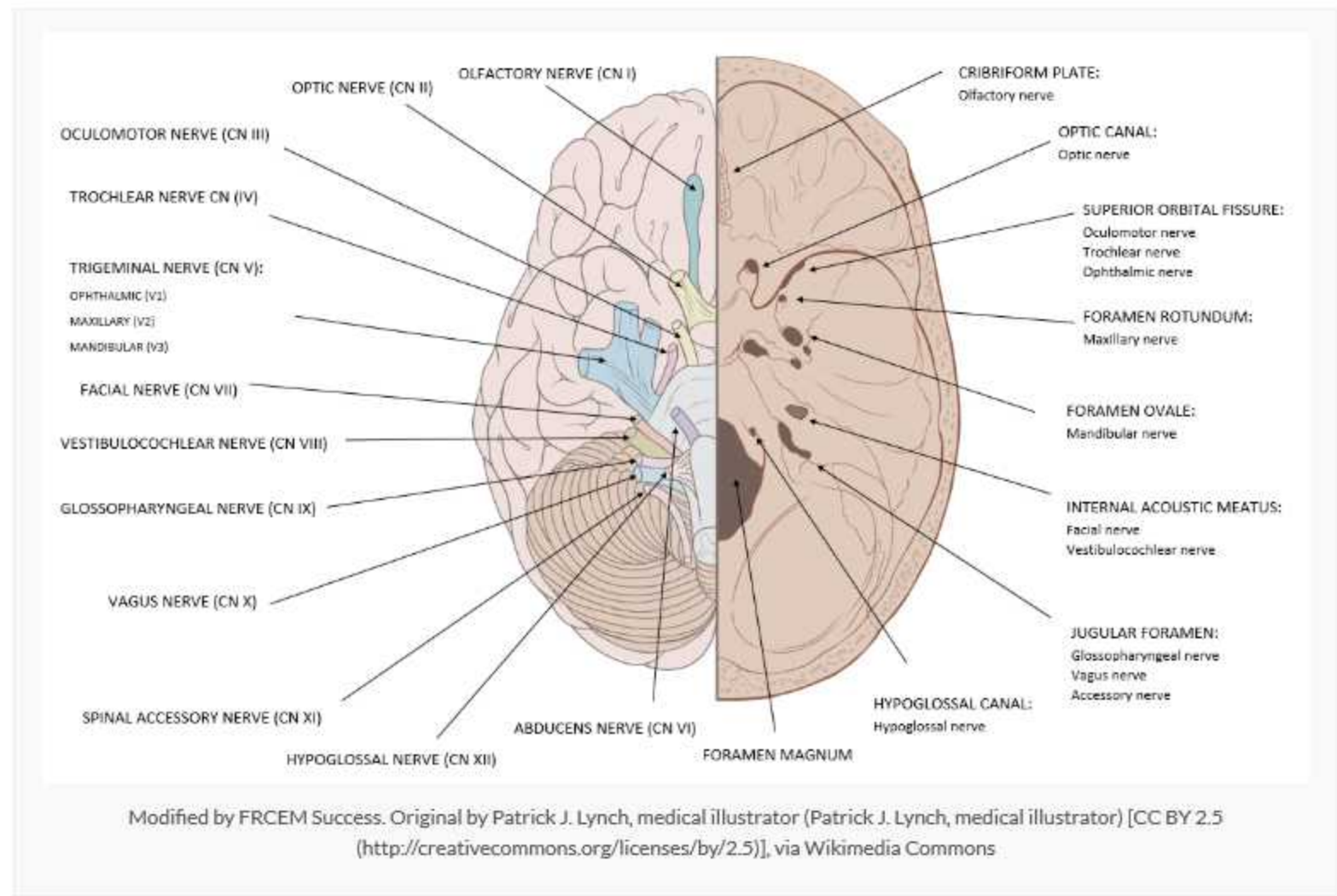
Function

Through its branches the mandibular nerve carries:

- General sensation from:
 - the lower teeth and associated gingivae
 - the anterior two-thirds of the tongue
 - mucosa on the floor of the oral cavity
 - mucosa and skin of the lower lip and chin
 - skin over the temple
 - the external ear, external auditory meatus and outer tympanic membrane
 - the temporomandibular joint
 - part of the cranial dura mater
- Motor innervation to:
 - the muscles of mastication (masseter, temporalis, medial and lateral pterygoids)
 - the tensor tympani muscle of the middle ear
 - the tensor veli palatini muscle of the soft palate
 - the mylohyoid muscle
 - the anterior belly of the digastric muscle
- Postganglionic parasympathetic fibres to the parotid gland

Anatomical course

The large sensory part originates from the trigeminal ganglion in the middle cranial fossa and descends vertically through the foramen ovale and enters the infratemporal fossa between the tensor veli palatini muscle and the upper head of the lateral pterygoid muscle. The small motor root passes medial to the trigeminal ganglion in the cranial cavity, then passes through the foramen ovale and immediately joins the sensory part of the mandibular nerve. All of the branches of the mandibular nerve originate in the infratemporal fossa.



Branches

Soon after the motor and sensory roots join, the mandibular nerve gives rise to a small sensory meningeal branch (supplying dura mater of the middle cranial fossa and mastoid cells) and the motor nerve to the medial pterygoid (innervating the medial pterygoid, the tensor tympani and the tensor veli palatini muscles).

The nerve then divides into an anterior and posterior trunk.

The anterior trunk gives rise to:

- The buccal nerve (sensory – innervating the skin and mucosa over the cheek)
- The masseteric nerve (innervating the masseter muscle)
- The deep temporal nerves (innervating the temporalis muscle)
- The nerve to the lateral pterygoid (innervating the lateral pterygoid muscle).

The posterior trunk gives rise to:

- The auriculotemporal nerve
- The lingual nerve
- The inferior alveolar nerve

Branch	Function
Auriculotemporal nerve	General sensation to skin over large area of temple, external ear, external auditory meatus, tympanic membrane and TMJ, carries postganglionic parasympathetic fibres from glossopharyngeal nerve to parotid gland
Inferior alveolar nerve	General sensation to lower teeth and associated gingivae, mucosa and skin of lower lip and skin of chin, motor innervation to mylohyoid and anterior belly of digastric muscle
Lingual nerve	General sensation to anterior two-thirds of tongue, floor of oral cavity

The auriculotemporal nerve carries general sensation from skin over a large area of the temple, the external ear, the external auditory meatus, the outer tympanic membrane and the temporomandibular joint. It also delivers postganglionic parasympathetic fibres from the glossopharyngeal nerve to the parotid gland.

The inferior alveolar nerve carries general sensation from the lower teeth and associated gingivae, mucosa and skin of the lower lip and skin of the chin and gives rise to a motor branch which innervates the mylohyoid muscle and the anterior belly of the digastric muscle.

The lingual nerve carries general sensation from the anterior two-thirds of the tongue, oral mucosa on the floor of the oral cavity and lingual gingivae associated with the lower teeth.

Question Navigator

85	Answered
86	Answered
87	Answered
88	Answered
89	Answered
90	Answered
91	Answered
92	Current Question
93	...
94	...
95	...
96	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 93 of 142

Which of the following is most likely to cause a homonymous hemianopia:



- ☐ a Pituitary adenoma
- ☐ b Posterior cerebral artery stroke
- ☐ c Optic neuritis
- ☐ d Craniopharyngioma
- ☐ e Optic glioma

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Answered

86 Answered

87 Answered

88 Answered

89 Answered

90 Answered

91 Answered

92 Answered

93 Current Question

94 ...

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 93 of 142

Which of the following is most likely to cause a homonymous hemianopia:

- Pituitary adenoma
- Posterior cerebral artery stroke** ✓
- Optic neuritis
- Craniopharyngioma
- Optic glioma



Answer

A posterior cerebral stroke will most likely result in a contralateral homonymous hemianopia with macular sparing.

Notes

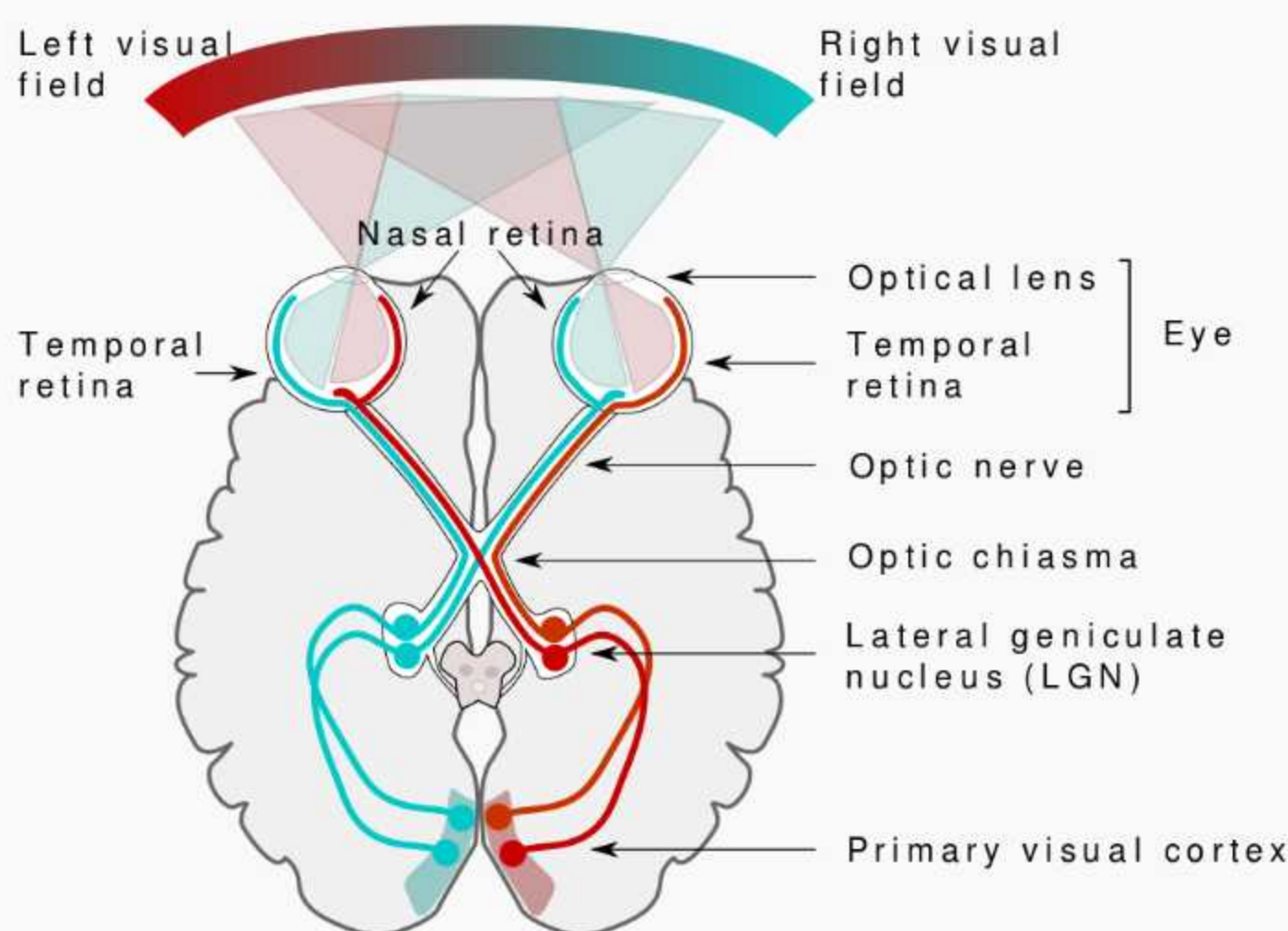
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (<http://creativecommons.org/licenses/by-sa/4.0/>)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

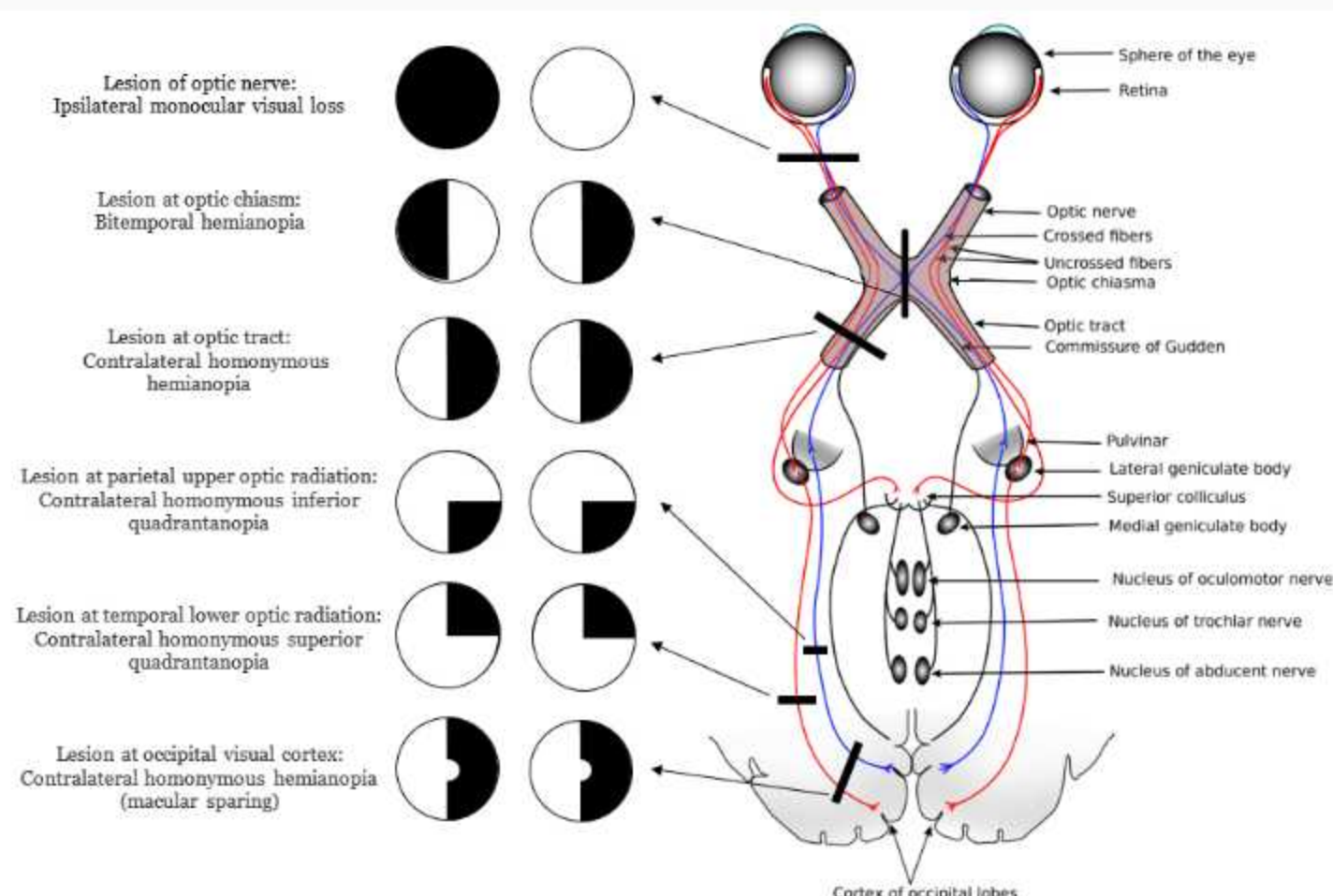
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 94 of 142



The hypoglossal nerve emerges from the cranial cavity through the:

- ☐ a Foramen rotundum
- ☐ b Foramen ovale
- ☐ c Hypoglossal canal
- ☐ d Internal acoustic meatus
- ☐ e Jugular foramen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

85 Answered

86 Answered

87 Answered

88 Answered

89 Answered

90 Answered

91 Answered

92 Answered

93 Answered

94 Current Question

95 ...

96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 94 of 142

The hypoglossal nerve emerges from the cranial cavity through the:

- a) Foramen rotundum
- b) Foramen ovale
- c) Hypoglossal canal
- d) Internal acoustic meatus
- e) Jugular foramen

Answer

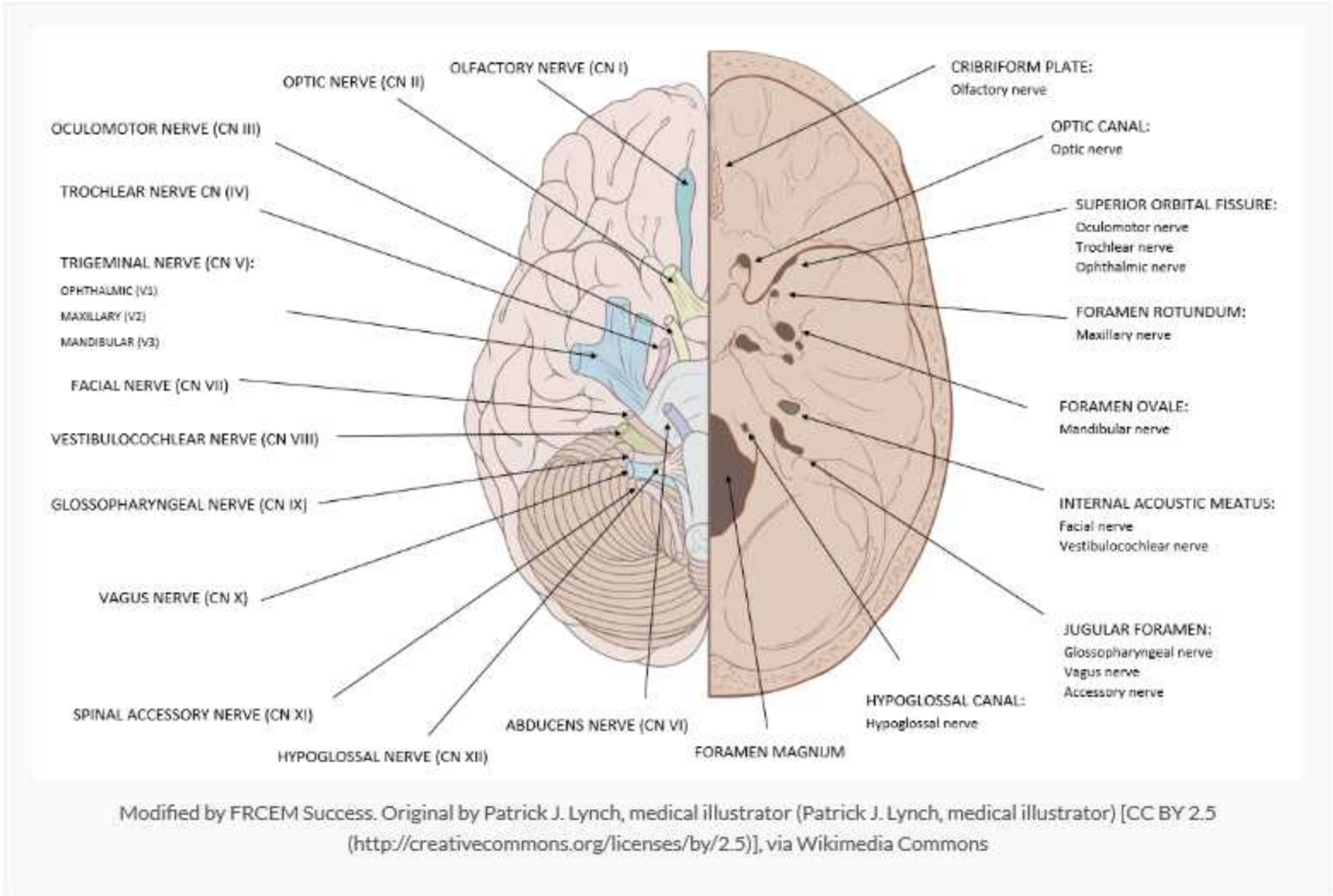
The hypoglossal nerve exits the cranial cavity through the hypoglossal canal.

Notes

Cranial nerve	Hypoglossal nerve (CN XII)
Key anatomy	Arises from medulla, exits skull through hypoglossal canal
Function	Motor: all intrinsic and extrinsic muscles of tongue (except for palatoglossus)
Assessment	Power and symmetry of tongue, tongue protrusion to look for deviation
Clinical effects of injury	Hemiparalysis of tongue with wasting and fasciculations, tongue deviation towards weak side
Causes of injury	Penetrating trauma, tumours, meningitis, extension of middle ear infection

Key anatomy

The hypoglossal nerve (CN XII) arises from the medulla and passes laterally across the posterior cranial fossa within the subarachnoid space before emerging from the cranial cavity via the hypoglossal canal. It then passes inferiorly to the angle of the mandible and moves in an anterior direction to enter the tongue.



Function

It innervates the hypoglossus, the genioglossus, the styloglossus and all of the intrinsic muscles of the tongue (i.e. all the muscles of the tongue except for the extrinsic palatoglossus muscle innervated by the vagus nerve).

Assessment

The hypoglossal nerve is assessed by asking the patient to protrude their tongue to look for deviation and testing power of the tongue by asking the patient to push their tongue against their cheek.

Clinical implications

In CN XII palsy there is hemiparalysis of the tongue associated with muscle wasting and fasciculations. The tongue deviates towards the weak side upon protrusion due to the unopposed action of the opposite genioglossus.

Isolated hypoglossal nerve injury is relatively uncommon. Possible causes include penetrating traumatic injuries, tumours (e.g. metastases, neurofibroma, cerebellopontine angle lesions), meningitis and infection from the middle ear spreading into the posterior fossa.

Question Navigator

- 85 Answered
- 86 Answered
- 87 Answered
- 88 Answered
- 89 Answered
- 90 Answered
- 91 Answered
- 92 Answered
- 93 Answered
- 94 Current Question
- 95 ...
- 96 ...

< Previous Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 95 of 142

Which of the following nerves is the afferent pathway of the corneal blink reflex:



- ☐ a Optic nerve
- ☐ b Ophthalmic nerve
- ☐ c Oculomotor nerve
- ☐ d Facial nerve
- ☐ e Maxillary nerve

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 85 Answered
- 86 Answered
- 87 Answered
- 88 Answered
- 89 Answered
- 90 Answered
- 91 Answered
- 92 Answered
- 93 Answered
- 94 Answered
- 95 Current Question
- 96 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 95 of 142



Which of the following nerves is the afferent pathway of the corneal blink reflex:

- a) Optic nerve
- b) Ophthalmic nerve
- c) Oculomotor nerve
- d) Facial nerve
- e) Maxillary nerve

Answer

The ophthalmic division of the trigeminal nerve is the afferent pathway of the corneal blink reflex. The facial nerve is the efferent pathway of the corneal blink reflex.

Notes

The trigeminal nerve (CN V) is the largest cranial nerve, originating from three sensory nuclei and one motor nucleus extending from the midbrain to the medulla and exiting the brainstem from the pons.

Cranial nerve	Trigeminal nerve (CN V)
Key anatomy	Arises from several nuclei in the brainstem, exits brainstem from pons
Sensory function	Face, oral and nasal cavities, frontal sinus, external ear, afferent pathway of corneal reflex
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric, parasympathetic fibres to lacrimal and nasal glands
Assessment	Sensation of face, jaw jerk, corneal blink reflex, power/bulk of muscles of mastication
Clinical effects of injury	Flaccid paralysis of muscles of mastication, jaw deviation towards affected side, loss of sensation to face, loss of afferent corneal reflex, loss of jaw jerk
Causes of injury	Trauma, anaesthetic block, tumours, cavernous sinus disease

Function

The trigeminal nerve is a mixed motor and sensory nerve. It has three main divisions:

- V1 ophthalmic
- V2 maxillary
- V3 mandibular

The trigeminal nerve supplies:

- Sensation to the face, mucous membranes of the nasal and oral cavities and frontal sinus, teeth, hard palate, soft palate and deep structures of the head (proprioception from muscles and the TMJ), the dura of the anterior and middle cranial fossa and the external ear
- The afferent pathway for the corneal reflex
- The muscles of mastication (temporalis, masseter, lateral and medial pterygoids)
- The tensor tympani muscle of the middle ear
- The tensor veli palatini muscle of the soft palate
- The mylohyoid and the anterior belly of the digastric muscles
- Parasympathetic fibres to lacrimal and nasal glands

Clinical implications

CN V palsy results in:

- Flaccid paralysis of the muscles of mastication
- Jaw deviation to the paralysed side (due to unopposed action of the opposite lateral pterygoid)
- Loss of sensation over the areas innervated by the three divisions of the trigeminal nerve
- Loss of the corneal reflex (afferent pathway)
- Loss of jaw jerk
- Paralysis of tensor tympani muscle leading to hypoacusis

The trigeminal nerve may be damaged by:

- Fractures of the middle third of the face (V2)
- Trauma to the mandible (V3)
- Anaesthetic block of the inferior alveolar nerve (V3)
- Basal skull fractures
- Tumours e.g. of the maxillary antrum and nasopharynx (V3)
- Cavernous sinus pathology (V1)
- Trigeminal neuralgia (sensory disorder characterised by severe shooting pains usually in the distribution of V2 or V3)

All three branches have bilateral cortical representation so a unilateral central lesion, for example a stroke, does not usually produce a deficit.

Question Navigator

85	Answered
86	Answered
87	Answered
88	Answered
89	Answered
90	Answered
91	Answered
92	Answered
93	Answered
94	Answered
95	Current Question
96	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 96 of 142



Regarding the oculomotor nerve, which of the following statements is CORRECT:

- ☐ a The oculomotor nerve has both motor and sensory function.
- ☐ b The oculomotor nerve innervates all of the extraocular muscles.
- ☐ c The oculomotor nerve innervates the dilator pupillae muscle.
- ☐ d The oculomotor nerve passes through the lateral part of the cavernous sinus.
- ☐ e The oculomotor nerve enters the orbit through the optic canal.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

96 Current Question

97 ...

98 ...

99 ...

100 ...

101 ...

102 ...

103 ...

104 ...

105 ...

106 ...

107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 96 of 142

Regarding the oculomotor nerve, which of the following statements is CORRECT:

- a) The oculomotor nerve has both motor and sensory function.
- b) The oculomotor nerve innervates all of the extraocular muscles.
- c) The oculomotor nerve innervates the dilator pupillae muscle.
- d) The oculomotor nerve passes through the lateral part of the cavernous sinus.
- e) The oculomotor nerve enters the orbit through the optic canal.

Answer

The oculomotor nerve does travel through the lateral aspect of the cavernous sinus, together with CN IV and VI nerves and the ophthalmic division of CN V. It enters the orbit through the superior orbital fissure. It innervates only four out of six of the extraocular muscles, in addition to the sphincter pupillae muscle. The oculomotor nerve is a pure motor nerve; it has no sensory function.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

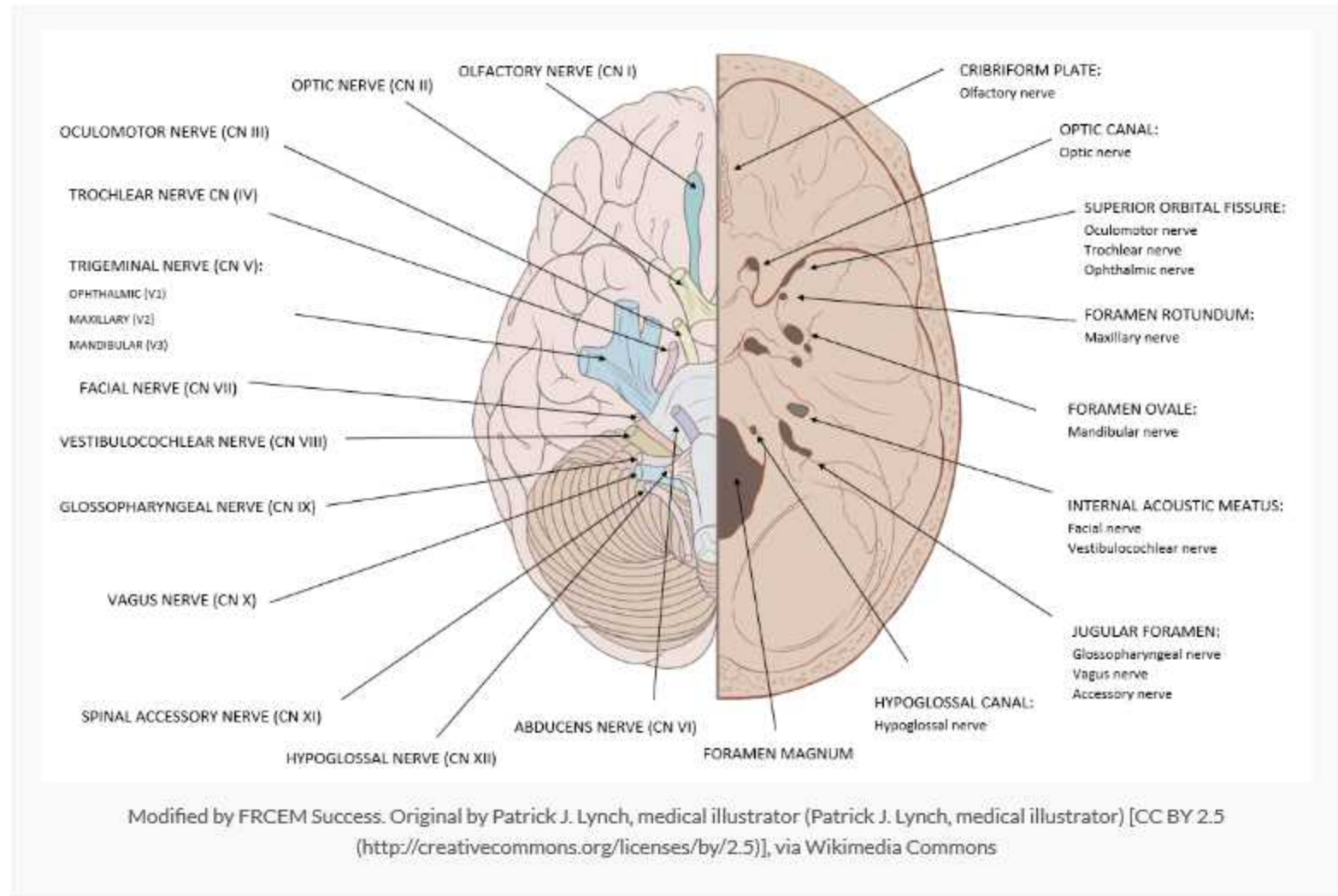
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

96 Current Question

97 ...

98 ...

99 ...

100 ...

101 ...

102 ...

103 ...

104 ...

105 ...

106 ...

107

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 97 of 142



The basilar artery is formed from which of the following blood vessels:

- ☐ a Internal carotid arteries
- ☐ b Anterior cerebral arteries
- ☐ c Vertebral arteries
- ☐ d External carotid arteries
- ☐ e Middle cerebral arteries

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

95	Answered
96	Answered
97	Current Question
98	...
99	...
100	...
101	...
102	...
103	...
104	...
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 97 of 142

☒ The basilar artery is formed from which of the following blood vessels:

- a) Internal carotid arteries
- b) Anterior cerebral arteries
- c) **Vertebral arteries** 
- d) External carotid arteries
- e) Middle cerebral arteries



Answer

The basilar artery is formed by the joining of the two terminal vertebral arteries.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

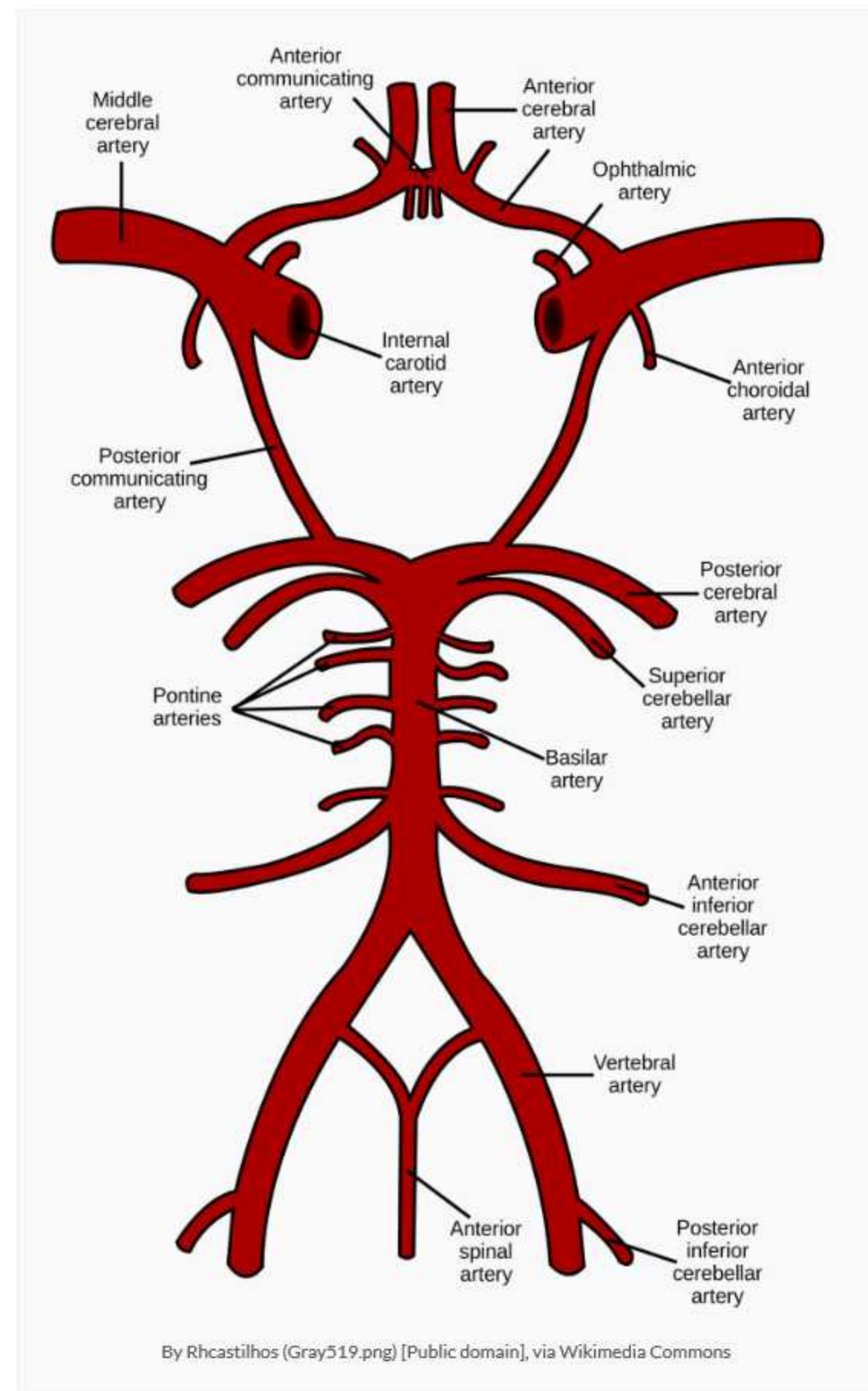
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebellar artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

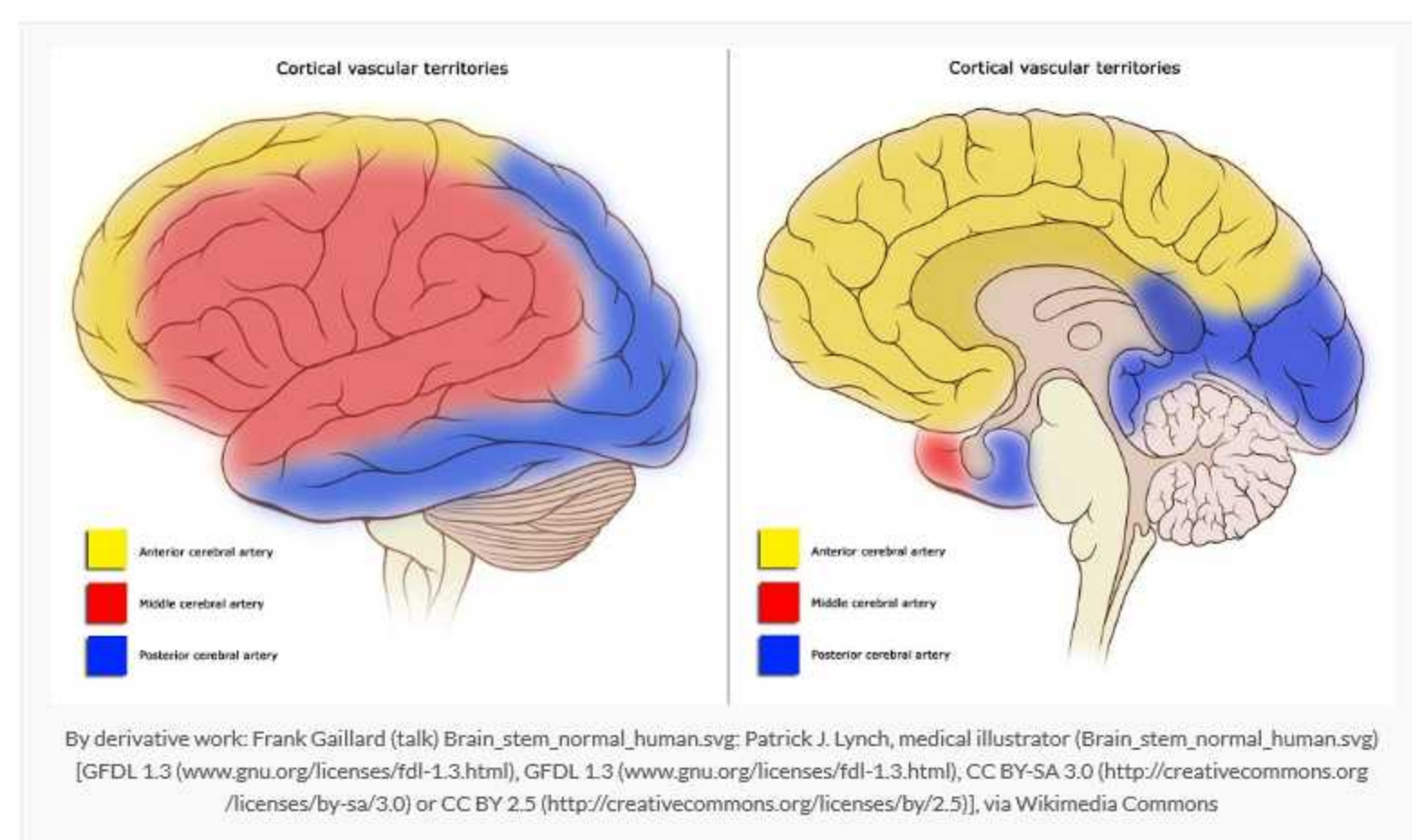
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none"> • FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change • PARIETAL LOBE: contralateral somatosensory loss in the lower limb • CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none"> • FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood • TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia • PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia • N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none"> • OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral) • TEMPORAL LOBE: confusion, memory deficit • OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



[< Previous](#) [Next >](#)

[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 98 of 142



A 35 year old woman presents to ED complaining of an inability to shrug her left shoulder or to turn her head to face the right side. The most likely injured nerve causing her symptoms exits the skull through which of the following:

- ☐ a Foramen ovale
- ☒ b Foramen rotundum
- ☐ c Hypoglossal canal
- ☐ d Jugular foramen
- ☐ e Internal auditory meatus

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

95	Answered
96	Answered
97	Answered
98	Current Question
99	...
100	...
101	...
102	...
103	...
104	...
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 98 of 142

A 35 year old woman presents to ED complaining of an inability to shrug her left shoulder or to turn her head to face the right side. The most likely injured nerve causing her symptoms exits the skull through which of the following:

- Foramen ovale
- Foramen rotundum
- Hypoglossal canal
- Jugular foramen
- Internal auditory meatus

Answer

The accessory nerve innervates the trapezius and sternocleidomastoid muscles responsible for shrugging the shoulders, and rotating the head to the opposite direction respectively. The accessory nerve exits the skull through the jugular foramen.

Notes

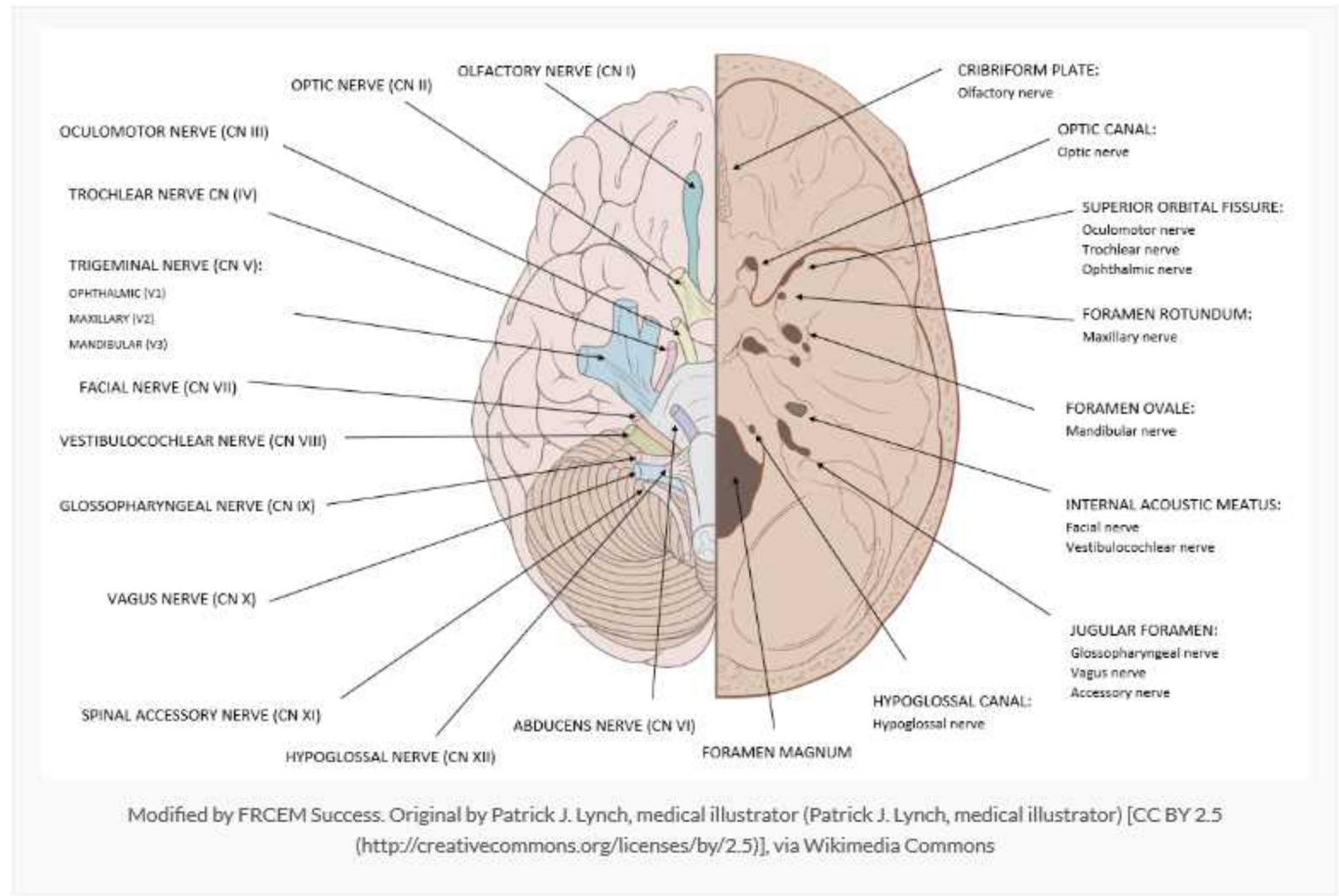
The accessory nerve (CN XI) is a motor nerve innervating the sternocleidomastoid and the trapezius muscles which mediate head and shoulder movement.

Cranial nerve	Spinal accessory nerve (CN XI)
Key anatomy	Originates from cervical segments C1 – C5/C6, enters cranial cavity through foramen magnum, travels through posterior cranial fossa and exits skull through jugular foramen
Function	Motor: sternocleidomastoid, trapezius
Assessment	Test head rotation and shoulder shrug against resistance
Clinical effects of injury	Inability to shrug ipsilateral shoulder, shoulder droop, inability to rotate head towards opposite side to the lesion
Causes of injury	Metastatic lymphadenopathy in neck, neck dissection surgery, internal jugular vein cannulation, blunt or penetrating neck trauma

Key anatomy

It is a unique cranial nerve because its roots actually arise from motor neurons in the upper five segments of the cervical spinal cord. The fibres leave the lateral surface of the spinal cord, joining together as they ascend, and enter the cranial cavity through the foramen magnum forming the accessory nerve. The accessory nerve then continues through the posterior cranial fossa and exits the skull through the jugular foramen before descending in the neck along the internal carotid artery to innervate the muscles.

A few rootlets arising from the medulla just inferior to the fibres that arise to form the vagus nerve, may be referred to as the cranial roots of the accessory nerve. Leaving the medulla these fibres course with the 'spinal' roots of the accessory nerve into the jugular foramen, at which point these cranial roots join the vagus nerve. They are distributed to the pharyngeal musculature innervated by the vagus nerve and are therefore usually described as being part of the vagus nerve.



Assessment

The accessory nerve is examined by asking the patient to rotate their head and shrug their shoulders against resistance.

Clinical implications

Clinical features of CN XI palsy include muscle wasting and paralysis of the sternocleidomastoid and trapezius muscles resulting in the inability to rotate the head to the side opposite the lesion and to shrug the ipsilateral shoulder (resulting in shoulder droop) respectively.

Damage can occur due to:

- Metastatic disease in the neck with lymph node involvement
- Neck dissection surgery
- Cannulation of the internal jugular vein
- Blunt or penetrating neck trauma

Question Navigator

96	Answered
97	Answered
98	Current Question
99	...
100	...
101	...
102	...
103	...
104	...
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 99 of 142



Regarding the glossopharyngeal nerve, which of the following statements is INCORRECT:

- ☐ a The glossopharyngeal nerve originates from the medulla.
- ☐ b The glossopharyngeal nerve emerges from the cranial cavity via the jugular foramen.
- ☐ c The glossopharyngeal nerve is the efferent nerve of the gag reflex.
- ☐ d The glossopharyngeal nerve innervates the stylopharyngeus muscle.
- ☐ e The glossopharyngeal nerve supplies parasympathetic fibres to the parotid gland.

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 95 Answered
- 96 Answered
- 97 Answered
- 98 Answered
- 99 Current Question
- 100 ...
- 101 ...
- 102 ...
- 103 ...
- 104 ...
- 105 ...
- 106 ...
- 107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 99 of 142

Regarding the glossopharyngeal nerve, which of the following statements is INCORRECT:

- a) The glossopharyngeal nerve originates from the medulla.
- b) The glossopharyngeal nerve emerges from the cranial cavity via the jugular foramen.
- c) The glossopharyngeal nerve is the efferent nerve of the gag reflex.
- d) The glossopharyngeal nerve innervates the stylopharyngeus muscle.
- e) The glossopharyngeal nerve supplies parasympathetic fibres to the parotid gland.

Answer

The glossopharyngeal nerve is the afferent pathway of the gag reflex. The vagus nerve is the efferent pathway of the gag reflex.

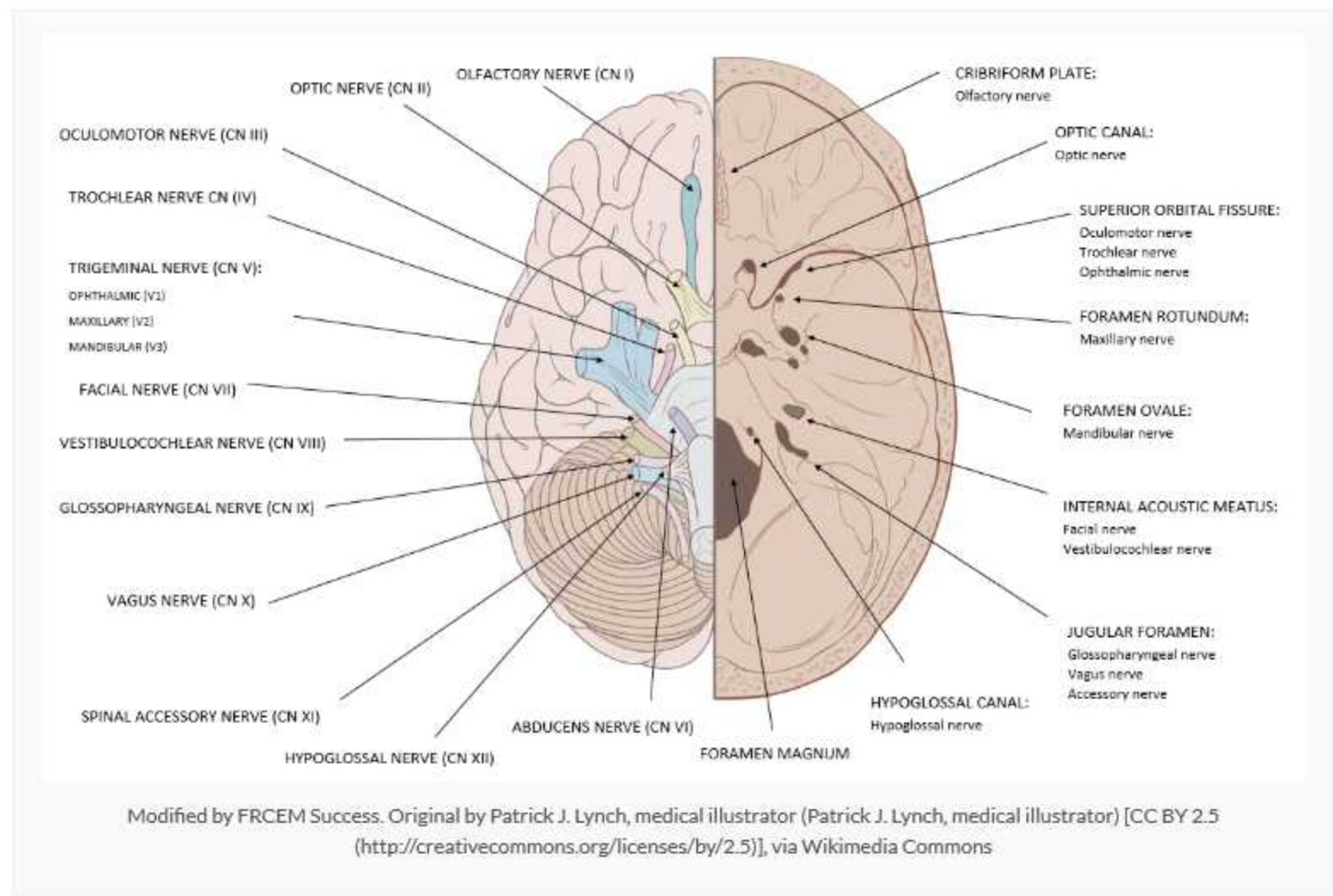
Notes

The glossopharyngeal nerve (CN IX) mediates taste, salivation and swallowing (together with CN X).

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Key anatomy

The glossopharyngeal nerve originates from the medulla and travels lateral in the posterior cranial fossa before emerging from the cranial cavity via the jugular foramen.



Function

The glossopharyngeal nerve carries:

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

Clinical implications

CN IX palsy will result in:

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

Isolated glossopharyngeal nerve palsy is rare. It is usually damaged with CN X and XI, close to the jugular foramen.

Causes of damage to CN IX include:

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Current Question
100	...
101	...
102	...
103	...
104	...
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 100 of 142

Which of the following muscles is NOT supplied by the facial nerve:

- ☐ a Posterior belly of the occipitofrontalis
- ☐ b Posterior belly of the digastric muscle
- ☐ c Stapedius
- ☐ d Stylohyoid muscle
- ☐ e Masseter

< Previous

Next >

See Answer

Something wrong?



Question Navigator

- 95 Answered
- 96 Answered
- 97 Answered
- 98 Answered
- 99 Answered
- 100 Current Question
- 101 ...
- 102 ...
- 103 ...
- 104 ...
- 105 ...
- 106 ...
- 107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 100 of 142



Which of the following muscles is NOT supplied by the facial nerve:

- a) Posterior belly of the occipitofrontalis
- b) Posterior belly of the digastric muscle
- c) Stapedius
- d) Stylohyoid muscle
- e) **Masseter** ✓

Answer

The facial nerve innervates the muscles of facial expression, the posterior belly of the digastric muscle, the stylohyoid muscle and the stapedius muscle. The masseter muscle is innervated by the mandibular division of the trigeminal nerve.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

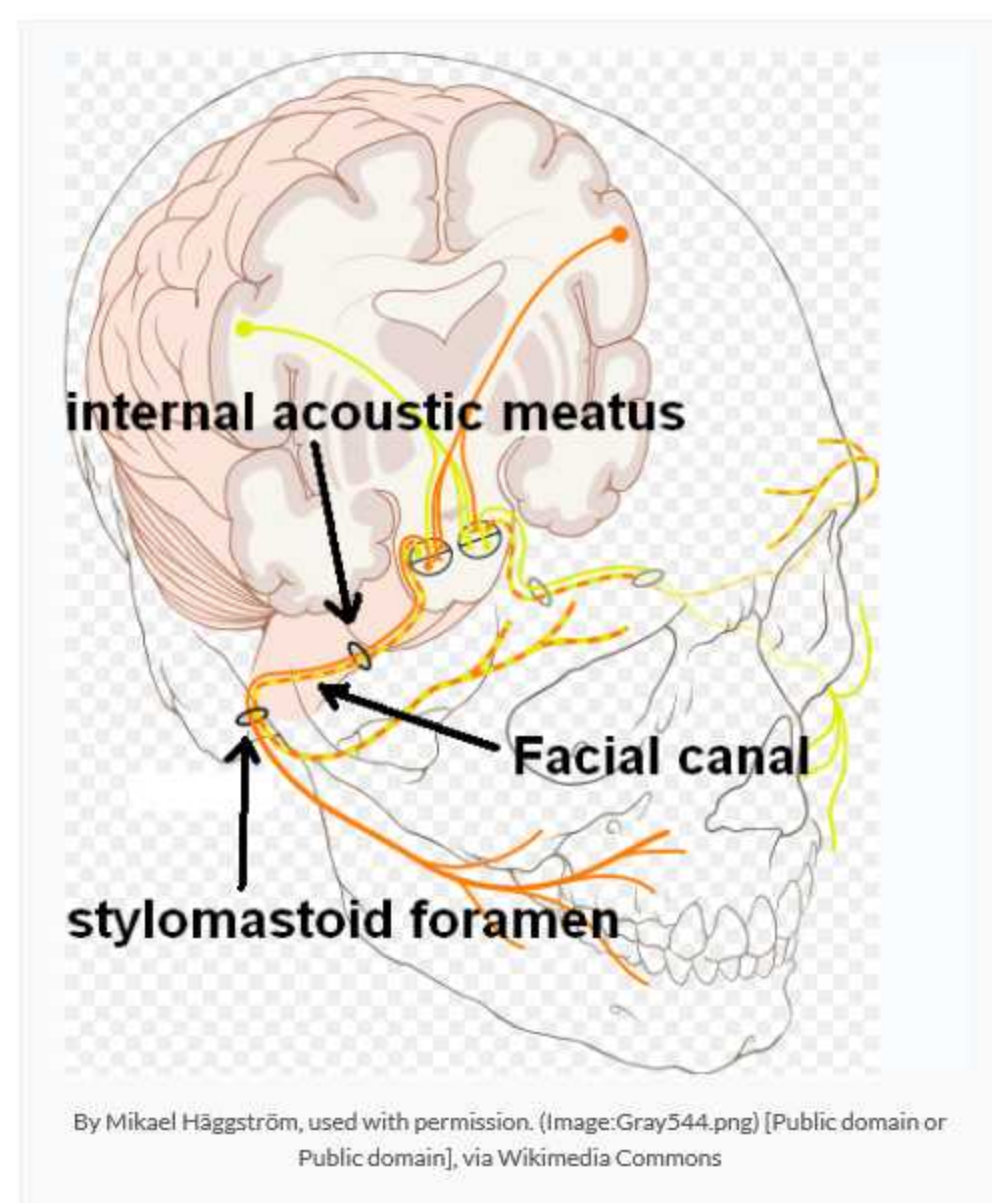
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

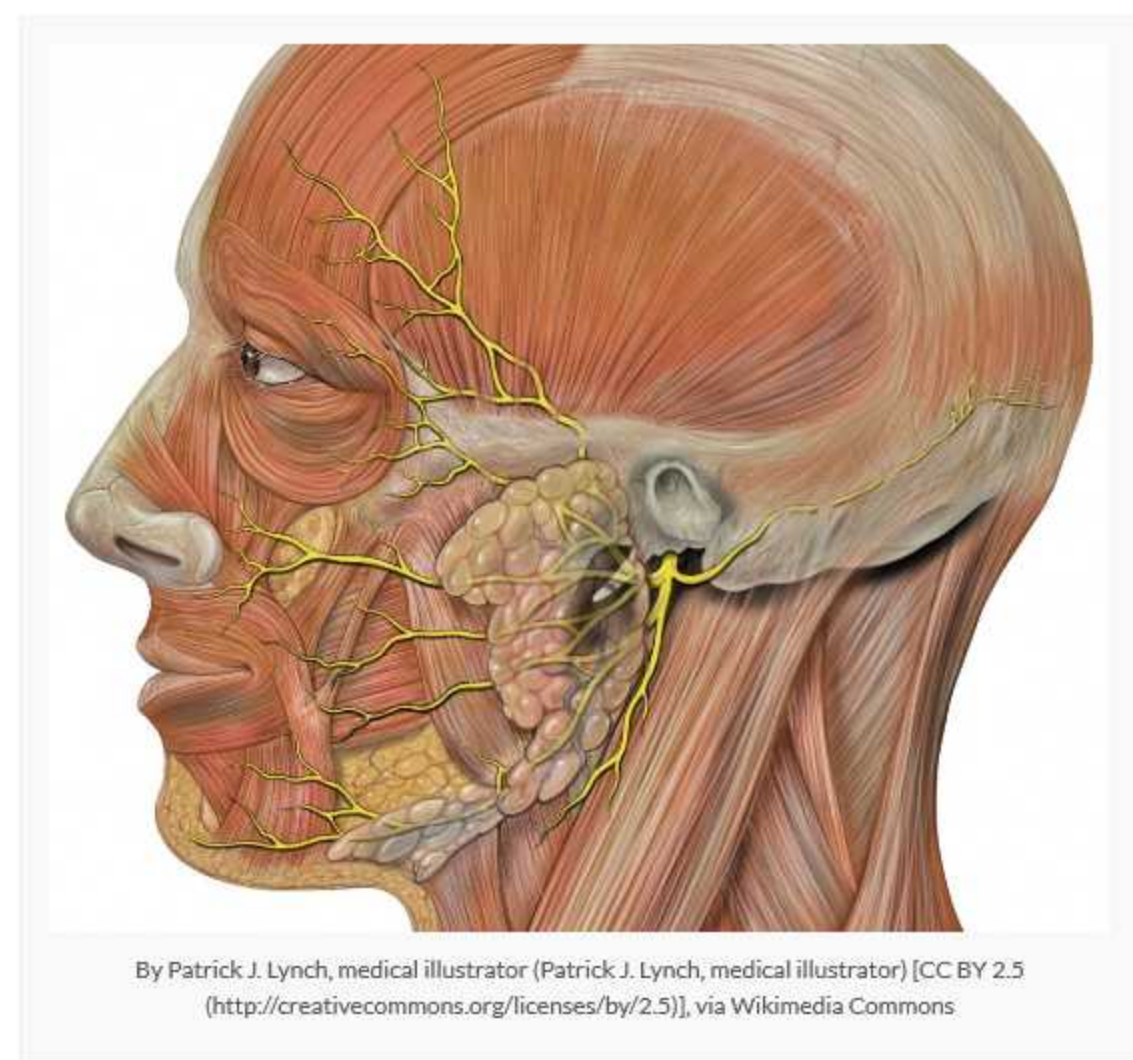
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[<< Previous](#)
[Next >>](#)
[Something wrong?](#)

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Answered
100	Current Question
101	...
102	...
103	...
104	...
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeInTheFastLane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 101 of 142



Which of the following clinical features would you most expect to see in a glossopharyngeal nerve palsy:

- ☐ a Tongue fasciculations
- ☐ b Uvular deviation
- ☐ c Loss of jaw jerk
- ☐ d Loss of gag reflex
- ☐ e Hoarseness

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

95 Answered

96 Answered

97 Answered

98 Answered

99 Answered

100 Answered

101 Current Question

102 ...

103 ...

104 ...

105 ...

106 ...

107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 101 of 142



Which of the following clinical features would you most expect to see in a glossopharyngeal nerve palsy:

- a) Tongue fasciculations
- b) Uvular deviation
- c) Loss of jaw jerk
- d) Loss of gag reflex
- e) Hoarseness

Answer

The glossopharyngeal nerve is the afferent pathway of the gag reflex. Tongue weakness and fasciculations may be seen in hypoglossal nerve palsy. Loss of jaw jerk may be seen in palsy of the mandibular division of the trigeminal nerve. Hoarseness and uvular deviation may be seen in vagus nerve palsy.

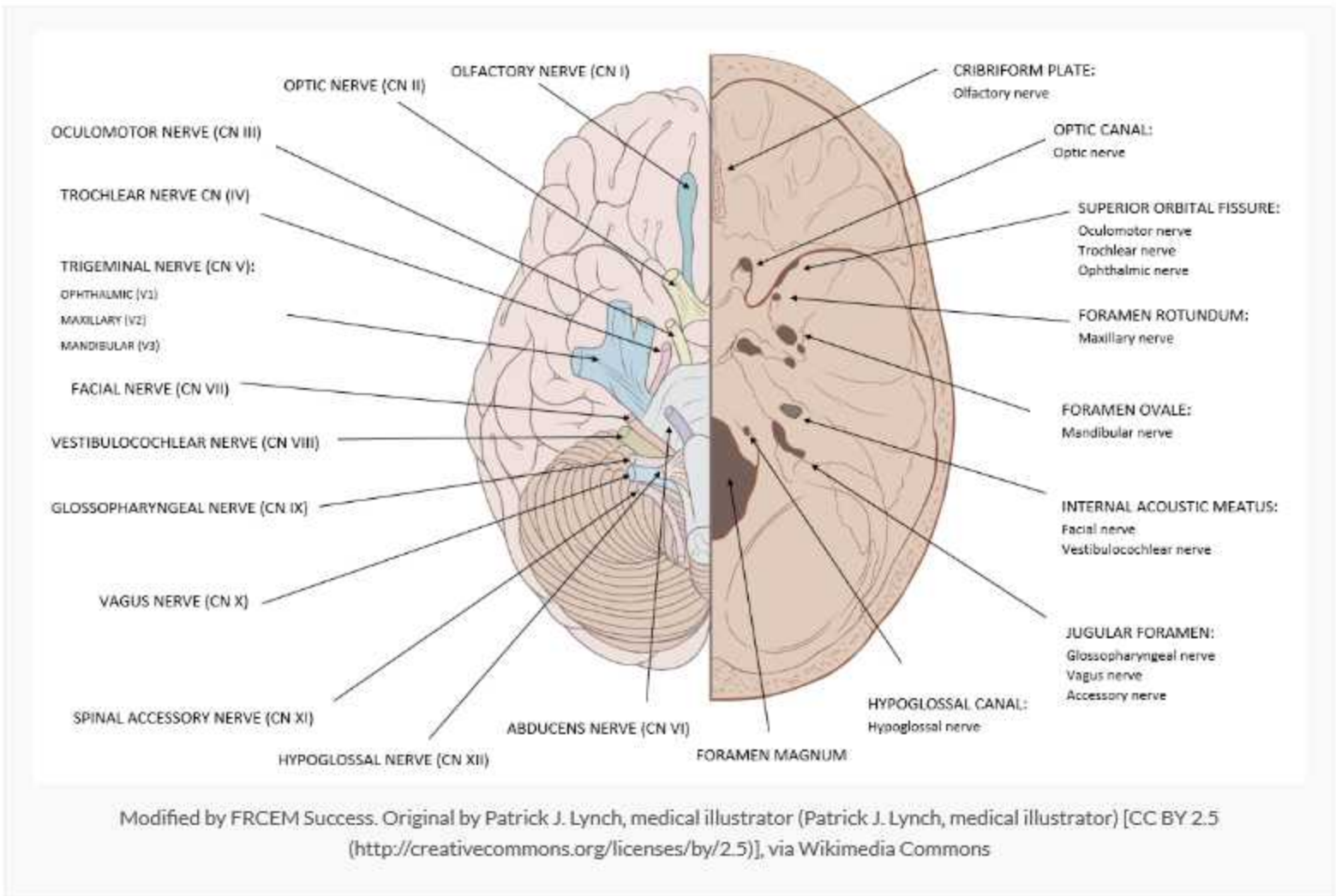
Notes

The glossopharyngeal nerve (CN IX) mediates taste, salivation and swallowing (together with CN X).

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Key anatomy

The glossopharyngeal nerve originates from the medulla and travels lateral in the posterior cranial fossa before emerging from the cranial cavity via the jugular foramen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The glossopharyngeal nerve carries:

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

Clinical implications

CN IX palsy will result in:

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

Isolated glossopharyngeal nerve palsy is rare. It is usually damaged with CN X and XI, close to the jugular foramen.

Causes of damage to CN IX include:

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Answered
100	Answered
101	Current Question
102	...
103	...
104	...
105	...
106	...
107	...

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 102 of 142



The blood supply to the parietal lobe is primarily supplied by which of the following arteries:

- ☐ a Anterior cerebral artery
- ☐ b Middle cerebral artery
- ☐ c Posterior cerebral artery
- ☐ d Basilar artery
- ☐ e Vertebral artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 95 Answered
- 96 Answered
- 97 Answered
- 98 Answered
- 99 Answered
- 100 Answered
- 101 Answered
- 102 Current Question
- 103 ...
- 104 ...
- 105 ...
- 106 ...
- 107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 102 of 142



The blood supply to the parietal lobe is primarily supplied by which of the following arteries:

- a) Anterior cerebral artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Basilar artery
- e) Vertebral artery

Answer

The blood supply to the parietal lobe is from the middle cerebral artery.

Notes

The parietal lobe lies between the frontal lobe anteriorly and the occipital lobe posteriorly, from which it is separated by the central sulcus and parieto-occipital sulcus, respectively. It sits superiorly in relation to the temporal lobe, being separated by the lateral sulcus.

Areas of the parietal lobe are responsible for:

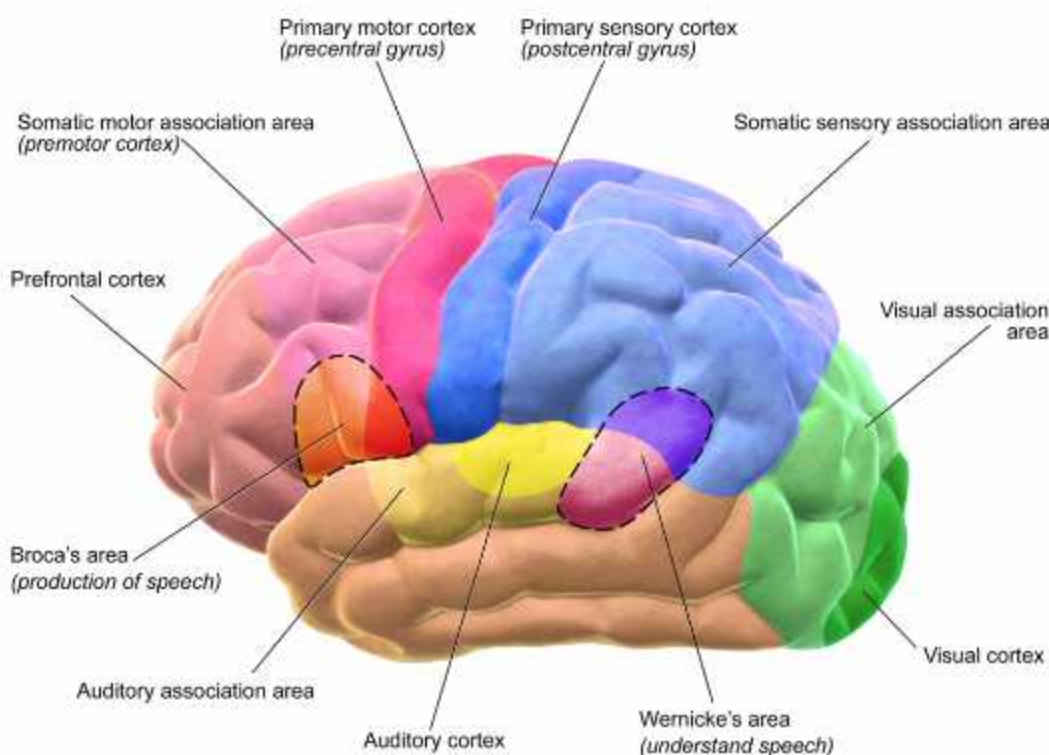
- Perceiving and interpreting sensation and proprioception
- Language and calculation of numbers on the dominant hemisphere side
- Integration of somatosensory, visual and auditory information and processing of visuospatial functions (e.g. 2-point discrimination) on the non-dominant hemisphere side

Area	Function	Lesion
Primary somatosensory cortex and somatosensory association cortex	Sensation and proprioception, visuo-spatial perception	Loss of sensation, difficulty distinguishing left from right, sensory neglect, apraxia, loss of hand-eye coordination, tactile agnosia
Arcuate fasciculus	Connects audiovisual association areas with Broca and Wernicke speech areas	Difficulties with reading, writing, naming, maths
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous inferior quadrantanopia

Areas of the parietal lobe

- The primary somatosensory cortex is located in the postcentral gyrus and is concerned with perceiving complex somatosensory stimuli from the contralateral side of the face and body. Together with the somatosensory association cortex, these areas are responsible for sensation and proprioception, and visuo-spatial perception.
- Pathways within the arcuate fasciculus are concerned with language as they connect Broca's area (frontal lobe) with Wernicke's area (temporal lobe).
- The fibres of the upper part of the optic radiation (serving the lower quadrant of the contralateral visual field) pass deep within the parietal lobe.

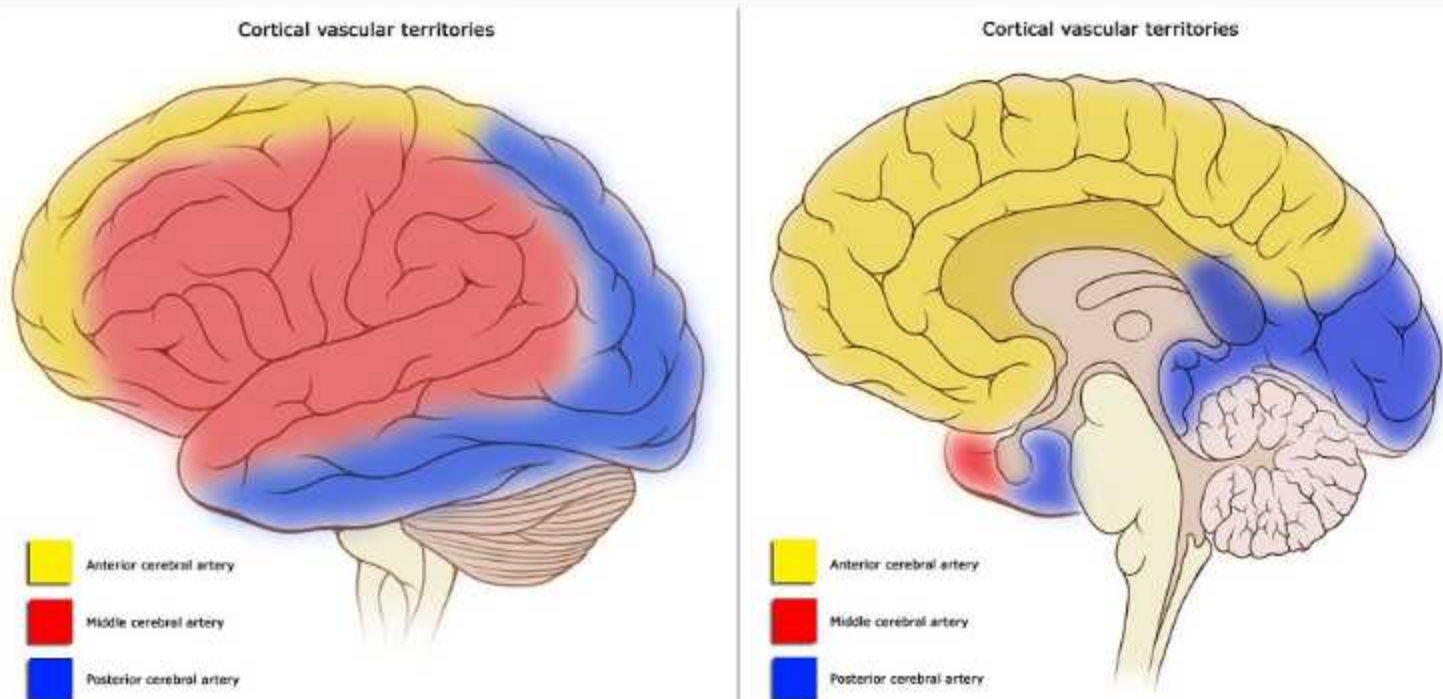
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the parietal lobe is from the middle cerebral artery.



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg; Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications:

Damage to the parietal lobe may result in:

- Cortical contralateral sensory loss with loss of proprioception and two-point discrimination
- Apraxia
- Tactile agnosia
- Attention deficits e.g. contralateral hemispatial neglect syndrome (an inability to perceive a contralateral stimulus when two simultaneous sensory stimuli are applied with equal intensity to corresponding sites on opposite sides of the body)
- Visual field defect (contralateral homonymous inferior quadrantanopia)

< Previous

Next >

Something wrong?

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Answered
100	Answered
101	Answered
102	Current Question
103	...
104	...
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 103 of 142



Which of the following best describes the position of the parietal lobe:

- ☐ a Posterior to the parieto-occipital sulcus
- ☐ b Anterior to the central sulcus and superior to the lateral sulcus
- ☐ c Posterior to the central sulcus and superior to the lateral sulcus
- ☐ d Anterior to the central sulcus and inferior to the lateral sulcus
- ☐ e Posterior to the central sulcus and inferior to the lateral sulcus

< Previous

Next >

See Answer

Something wrong?

Question Navigator

95 Answered

96 Answered

97 Answered

98 Answered

99 Answered

100 Answered

101 Answered

102 Answered

103 Current Question

104 ...

105 ...

106 ...

107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 103 of 142



Which of the following best describes the position of the parietal lobe:

- Posterior to the parieto-occipital sulcus
- Anterior to the central sulcus and superior to the lateral sulcus
- Posterior to the central sulcus and superior to the lateral sulcus** ✓
- Anterior to the central sulcus and inferior to the lateral sulcus
- Posterior to the central sulcus and inferior to the lateral sulcus

Answer

The parietal lobe extends from the central sulcus to the occipital lobe and lies posterior to the central sulcus and superior to the lateral sulcus and the temporal lobe.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

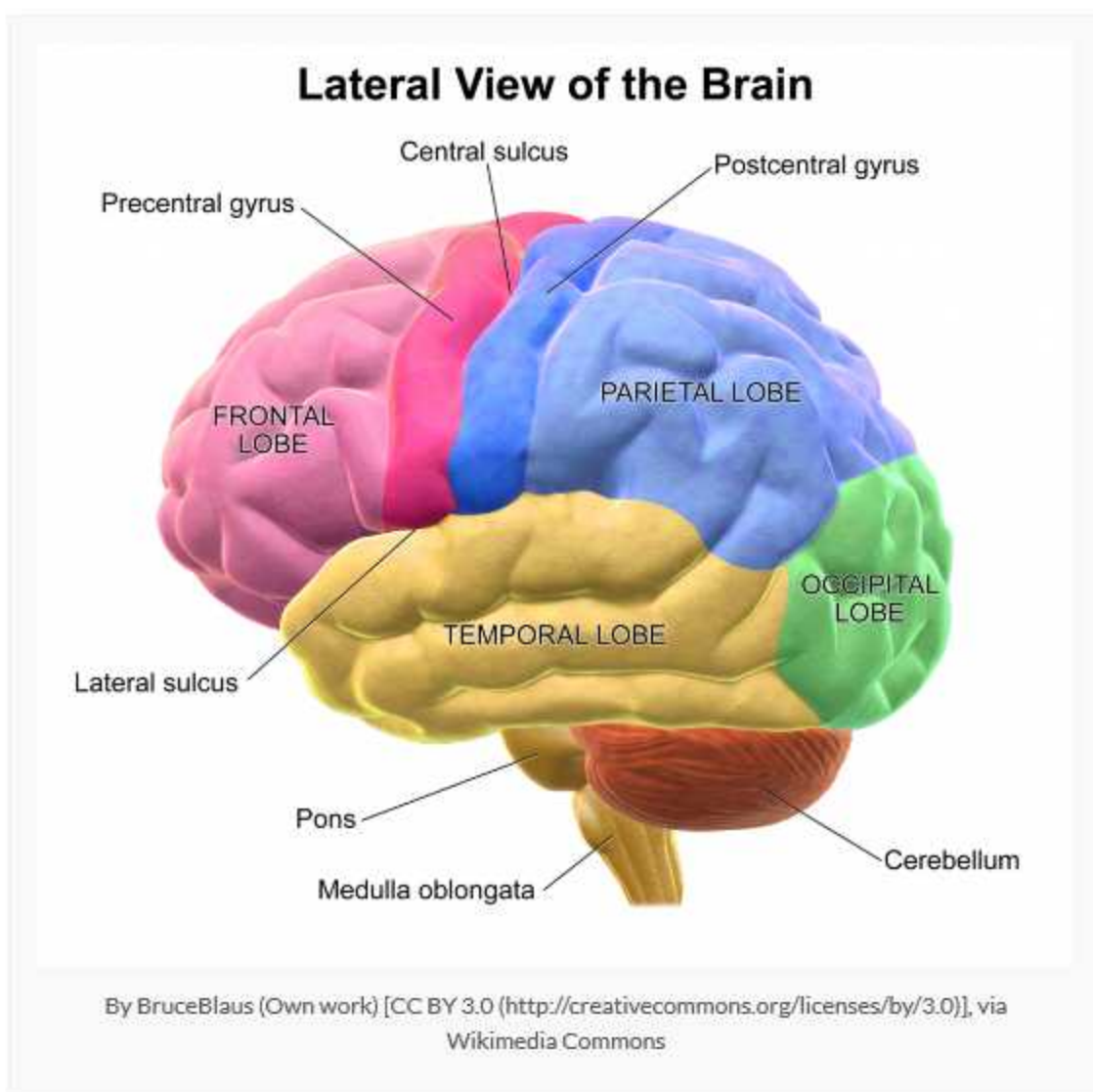
Cerebral cortex

The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus



Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

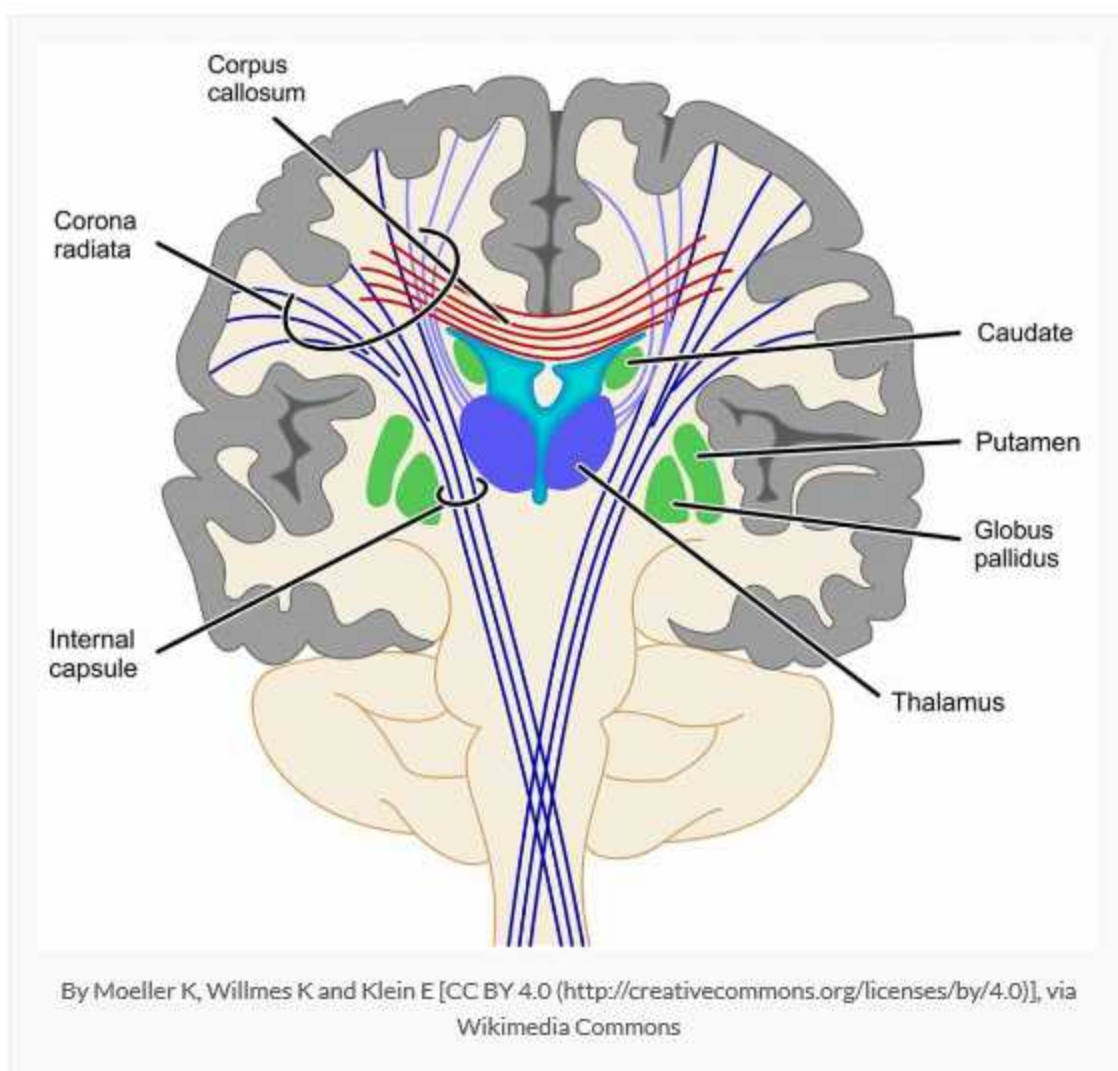
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



Question Navigator

96	Answered
97	Answered
98	Answered
99	Answered
100	Answered
101	Answered
102	Answered
103	Current Question
104	...
105	...
106	...
107	...

[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 104 of 142

Which of the following is NOT a typical cerebellar sign:

- ☐ a Dysdiadochokinesia
- ☐ b Nystagmus
- ☐ c Intention tremor
- ☐ d Hypertonia
- ☐ e Scanning speech

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)


Question Navigator

- 95 Answered
- 96 Answered
- 97 Answered
- 98 Answered
- 99 Answered
- 100 Answered
- 101 Answered
- 102 Answered
- 103 Answered
- 104 Current Question
- 105 ...
- 106 ...
- 107 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 104 of 142


 Which of the following is NOT a typical cerebellar sign:


- a)

Dysdiadochokinesia
- b)

Nystagmus
- c)

Intention tremor
- d)

Hypertonia 
- e)

Scanning speech 



Answer

Hypotonia is characteristic of cerebellar dysfunction.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebellum

The cerebellum consists of two lateral hemispheres and a midline part, sits infratentorially within the posterior cranial fossa and lies between the temporal and occipital lobes and the brainstem.



By Image:Brain human sagittal section.svg by Patrick J. Lynch; Image:Brain bulbar region.PNG by DO11.10; present image by Fvasconcellos. [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

The cerebellum has three primary functions:

- Maintenance of posture and balance
- Maintenance of muscle tone
- Coordination of voluntary motor activity

Therefore postural reflexes, truncal stability and synergistic muscular movements all depend upon an intact cerebellum. Cerebellar lesions do not cause paralysis but do lead to disturbance of balance and movement.

The cerebellum receives its blood supply from the posterior inferior cerebellar artery, the anterior inferior cerebellar artery and the superior cerebellar artery. Interruption to the blood flow in any of the blood vessels will lead to cerebellar signs.

Cerebellar dysfunction is characterised by DANISH signs:

- Dysmetria (past-pointing) and Dysdiadochokinesia (inability to perform rapid alternating movements)
- Ataxia (lack of coordination of gait, trunk and limbs)
- Nystagmus
- Intention tremor
- Slow/Slurred/Scanning Speech
- Hypotonia

< Previous

Next >

Something wrong?

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Answered
100	Answered
101	Answered
102	Answered
103	Answered
104	Current Question
105	...
106	...
107	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeInTheFastLane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 105 of 142



The facial nerve exits the skull through the:

- ☐ a Stylomastoid foramen
- ☐ b Foramen ovale
- ☒ c Jugular foramen
- ☐ d Foramen rotundum
- ☐ e Hypoglossal canal

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 95 Answered
- 96 Answered
- 97 Answered
- 98 Answered
- 99 Answered
- 100 Answered
- 101 Answered
- 102 Answered
- 103 Answered
- 104 Answered
- 105 Current Question
- 106 ...
- 107

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 105 of 142

The facial nerve exits the skull through the:

- a) Stylomastoid foramen
- b) Foramen ovale
- c) Jugular foramen
- d) Foramen rotundum
- e) Hypoglossal canal

Answer

The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

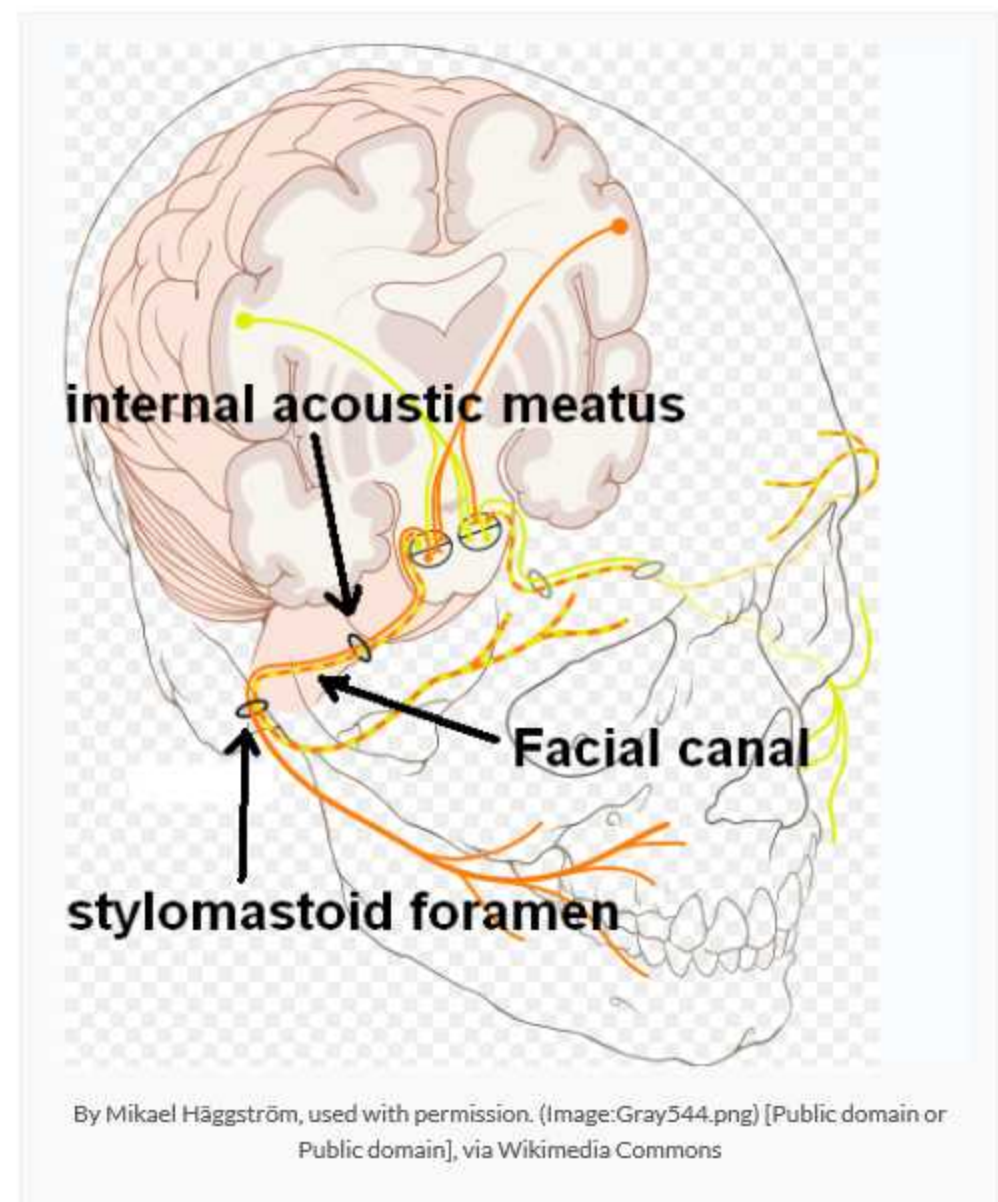
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

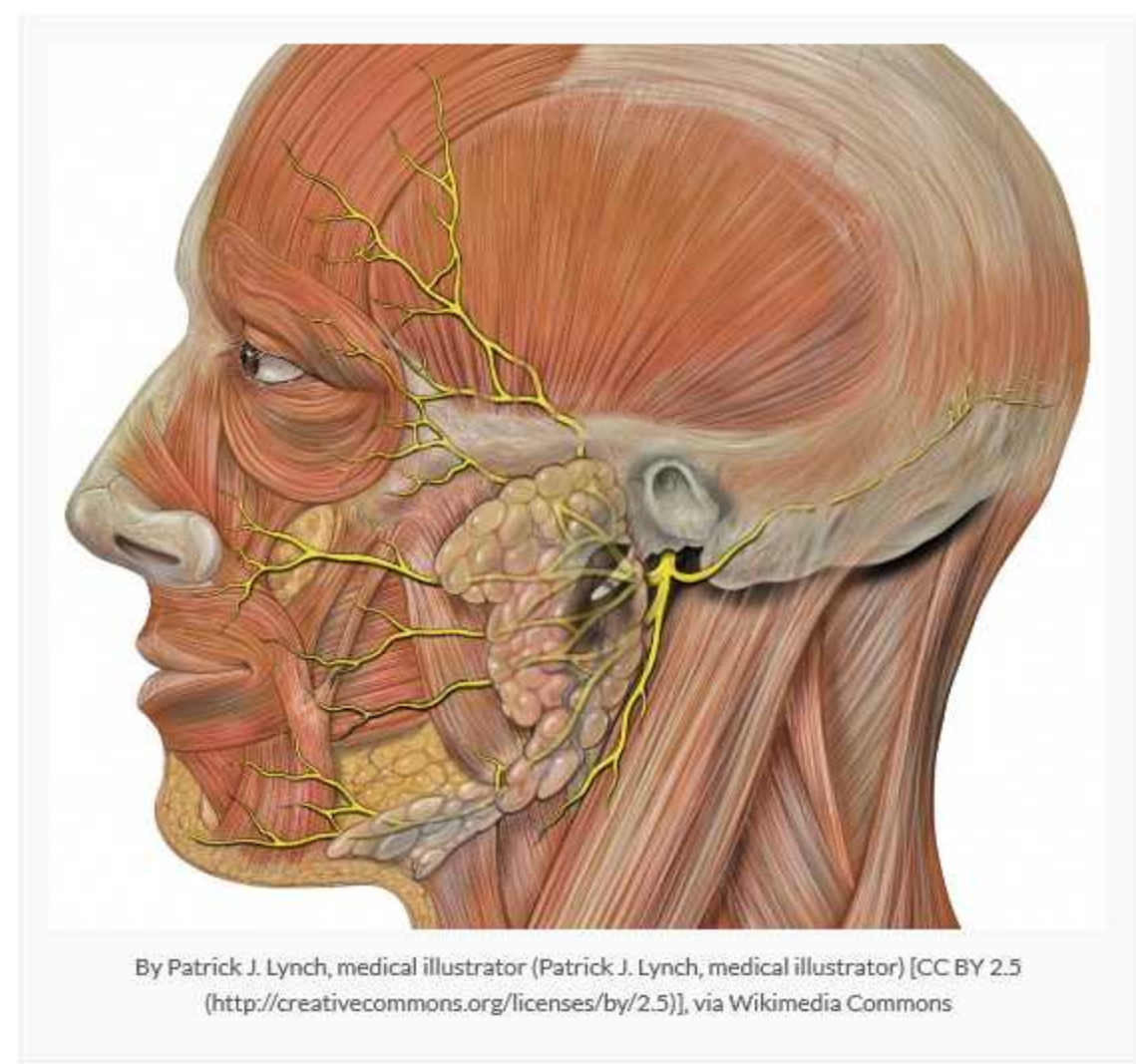
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Answered
100	Answered
101	Answered
102	Answered
103	Answered
104	Answered
105	Current Question
106	...
107	

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeInTheFastLane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 106 of 142

What type of visual field defect are you most likely to see in a lesion of the parietal optic radiation:



- ☐ a Bitemporal hemianopia
- ☐ b Contralateral homonymous inferior quadrantanopia
- ☐ c Contralateral homonymous hemianopia
- ☐ d Contralateral homonymous superior quadrantanopia
- ☐ e Homonymous hemianopia with macular sparing

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 95 Answered
- 96 Answered
- 97 Answered
- 98 Answered
- 99 Answered
- 100 Answered
- 101 Answered
- 102 Answered
- 103 Answered
- 104 Answered
- 105 Answered
- 106 Current Question
- 107

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 106 of 142

What type of visual field defect are you most likely to see in a lesion of the parietal optic radiation:

- a) Bitemporal hemianopia
- b) Contralateral homonymous inferior quadrantanopia
- c) Contralateral homonymous hemianopia
- d) Contralateral homonymous superior quadrantanopia
- e) Homonymous hemianopia with macular sparing

Answer

A lesion of the parietal optic radiation will result in a contralateral homonymous inferior quadrantanopia.

Notes

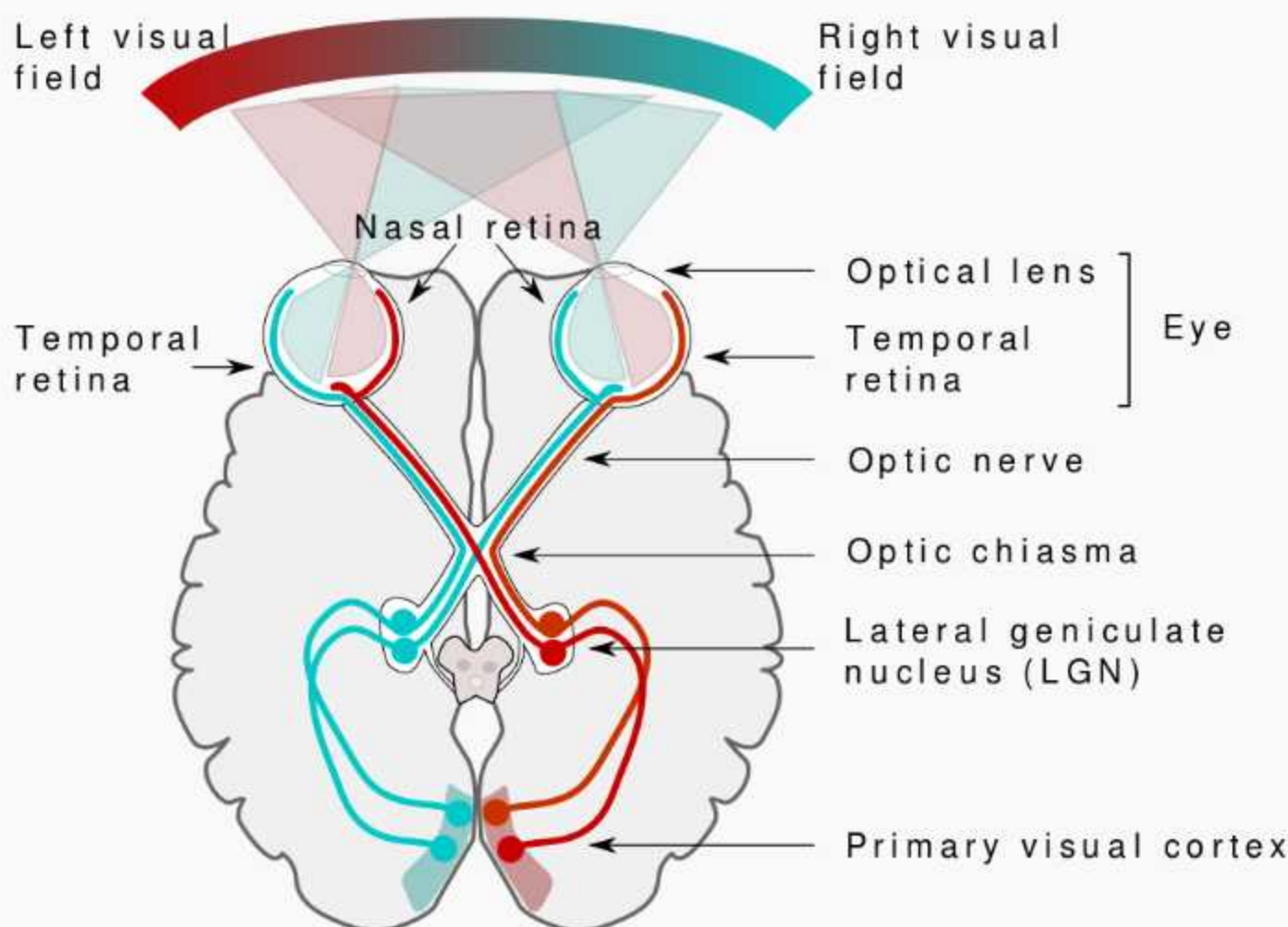
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

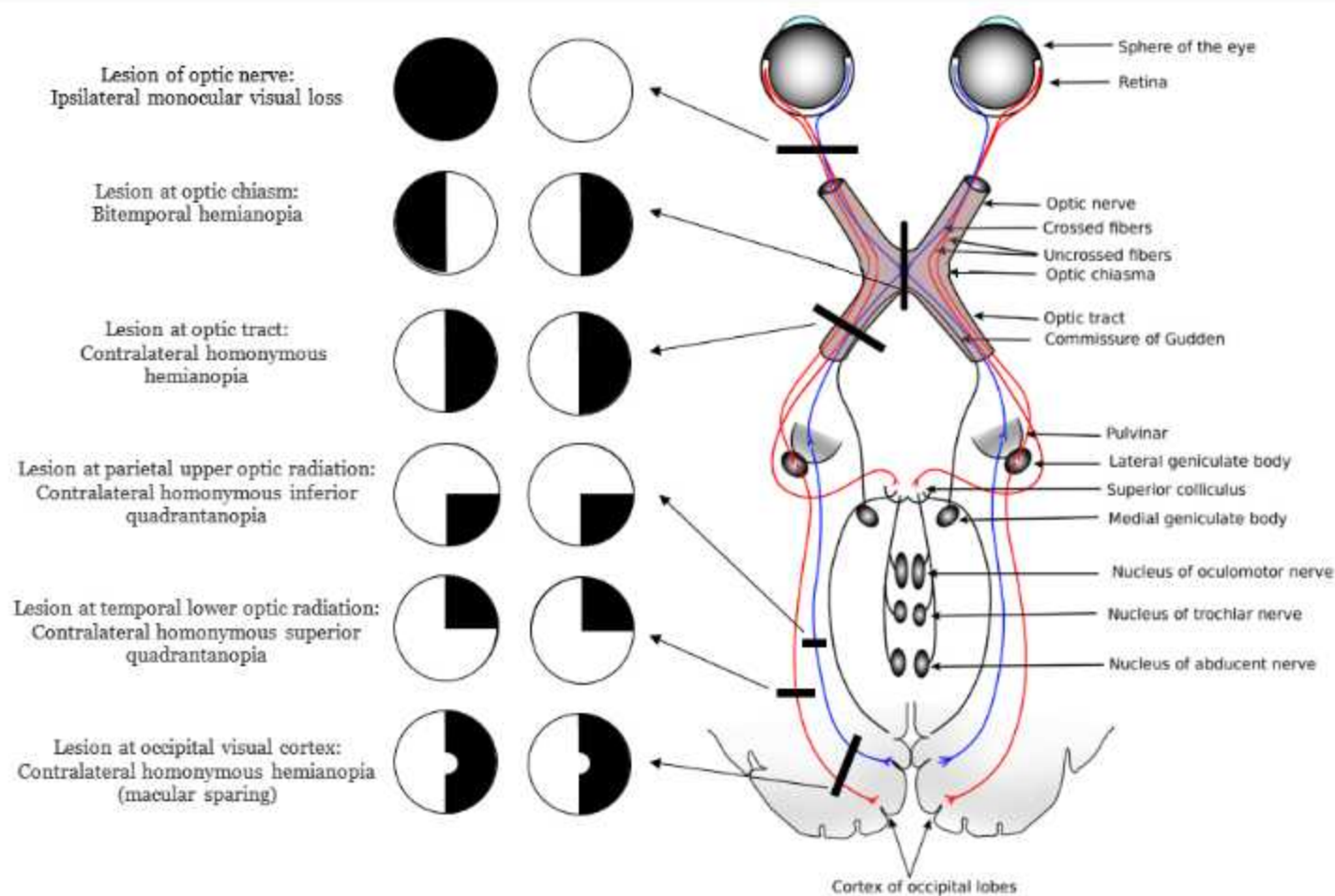
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

Question Navigator

95	Answered
96	Answered
97	Answered
98	Answered
99	Answered
100	Answered
101	Answered
102	Answered
103	Answered
104	Answered
105	Answered
106	Current Question
107	

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 107 of 142



The brainstem comprises which of the following:

- ☐ a Midbrain and hindbrain
- ☐ b Pons, medulla and cerebellum
- ☐ c Thalamus and hypothalamus
- ☐ d Pons, medulla and midbrain
- ☐ e Midbrain and cerebellum

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Current Question

108 ...

109 ...

110 ...

111 ...

112 ...

113 ...

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 107 of 142



The brainstem comprises which of the following:

- a) Midbrain and hindbrain
- b) Pons, medulla and cerebellum
- c) Thalamus and hypothalamus
- d) Pons, medulla and midbrain
- e) Midbrain and cerebellum

Answer

The brainstem comprises the midbrain, the pons and the medulla.

Notes

Overview of the brain

The major parts of the developed brain are:

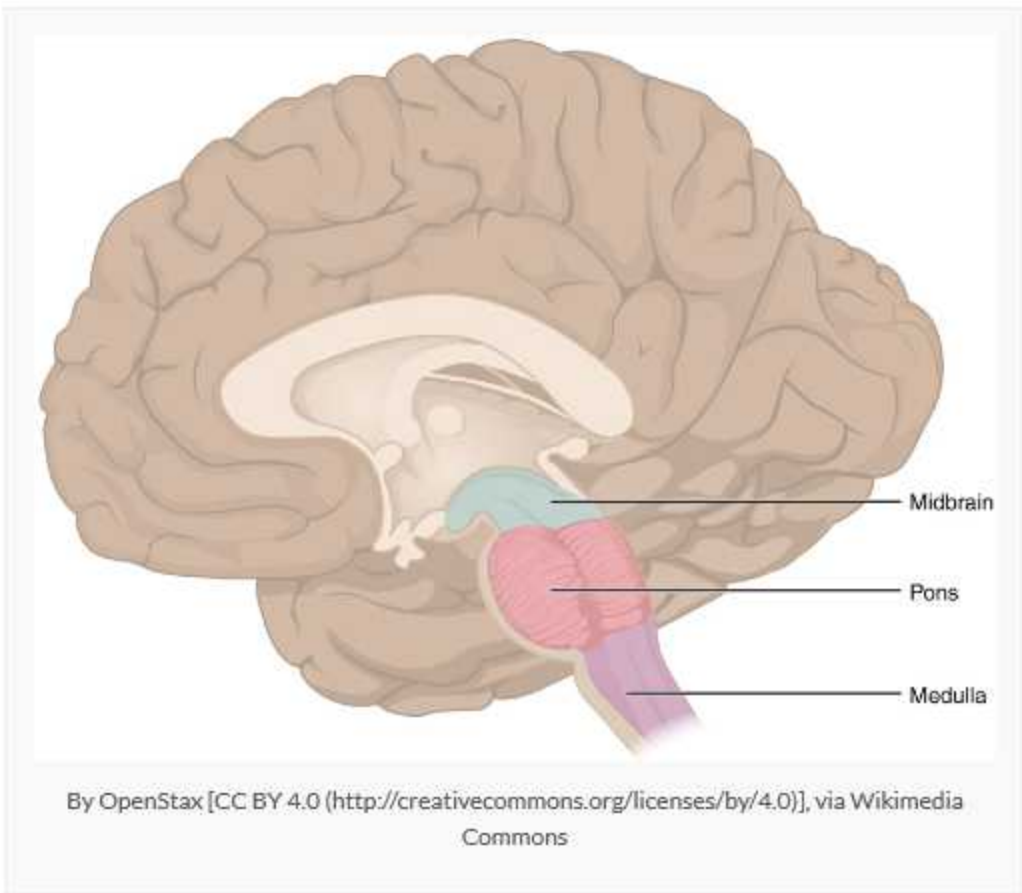
- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Brainstem

The brainstem comprises the midbrain, the pons and the medulla. It extends from the tentorial aperture to the level of C1. The medulla passes out of the cranial cavity via the foramen magnum and becomes the spinal cord as C1 roots emerge. The cells of the brainstem are predominantly clumped into nuclei.



Midbrain

The midbrain lies predominantly within the posterior cranial fossa. The aperture in the tentorium cerebelli lies on its dorsal surface. The midbrain receives its blood supply from the posterior cerebral and superior cerebellar arteries (ex-basilar). Dopaminergic cells sit within the midbrain within the substantia nigra; loss of dopaminergic neurons is the basis of Parkinson's disease.

Pons

The pons houses nuclei of the trigeminal nerve, the abducens nerve, the facial nerve and the vestibulocochlear nerve. This knowledge allows prediction of the clinical effects of a pontine haemorrhage:

- Abducens nucleus (lateral rectus paralysis)
- Vestibular nuclei (nystagmus, nausea, vomiting, vertigo)
- Cochlear nuclei (central nerve deafness)
- Trigeminal nuclei (paralysis of muscles of mastication, jaw deviation, loss of facial sensation)
- Facial nucleus (facial nerve paralysis and loss of taste sensation from anterior tongue)

The pons receives its blood supply from pontine branches of the basilar artery.

Medulla

The medulla oblongata is the upward continuation of the spinal cord. It receives its blood supply from the posterior inferior cerebellar arteries and branches of the vertebral and basilar arteries.

Lateral medullary syndrome results from occlusion of the intracranial portion of the vertebral artery (most commonly) or of the posterior inferior cerebellar artery (PICA). The resultant structures affected are the:

- Vestibular nuclei (nystagmus, nausea, vomiting, vertigo)
- Inferior cerebellar peduncle (cerebellar signs)
- Nucleus ambiguus of glossopharyngeal and vagus nerve (ipsilateral laryngeal, pharyngeal and palatal paralysis with dysarthria, dysphagia, dysphonia)
- Spinothalamic tracts (contralateral loss of pain and temperature from trunk and limbs)
- Spinal trigeminal nucleus and tract (ipsilateral loss of pain and temperature from face)
- Descending sympathetic tract (ipsilateral Horner's syndrome)

Medial medullary syndrome results from occlusion of small perforating branches from the vertebral or proximal basilar artery such as the anterior spinal artery. The resultant structures affected are the:

- Corticospinal tract (contralateral hemiparesis of trunk and extremities)
- Medial lemniscus (contralateral loss of proprioception, two-point discrimination and vibration of trunk and limbs)
- Hypoglossal nerve roots (ipsilateral flaccid paralysis of tongue)

Question Navigator

106	Answered
107	Current Question
108	...
109	...
110	...
111	...
112	...
113	...
114	...
115	...
116	...
117	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 108 of 142

The substantia nigra is located in which of the following regions of the brain:



- ☐ a Medulla oblongata
- ☐ b Pons
- ☐ c Thalamus
- ☐ d Internal capsule
- ☐ e Midbrain

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Current Question

109 ...

110 ...

111 ...

112 ...

113 ...

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



 The substantia nigra is located in which of the following regions of the brain:

- a) Medulla oblongata
- b) Pons
- c) **Thalamus** ❌
- d) Internal capsule
- e) Midbrain ✅

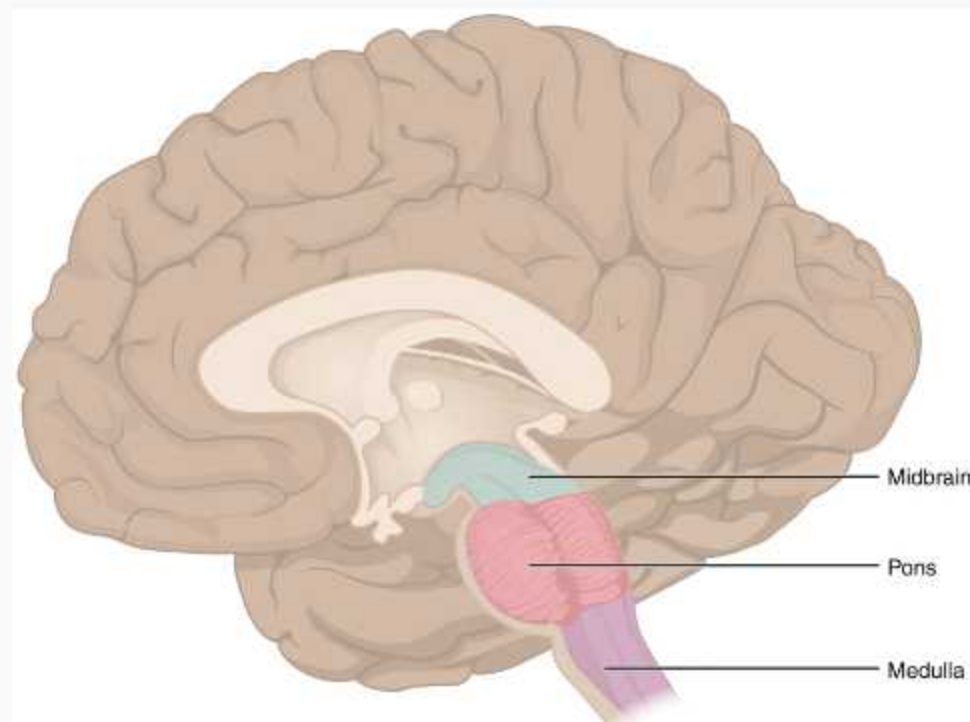
The midbrain contains the substantia nigra, the largest nucleus of the midbrain; degeneration of this extrapyramidal motor nucleus results in Parkinson's disease.

Overview of the brain

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

The brainstem comprises the midbrain, the pons and the medulla. It extends from the tentorial aperture to the level of C1. The medulla passes out of the cranial cavity via the foramen magnum and becomes the spinal cord as C1 roots emerge. The cells of the brainstem are predominantly clumped into nuclei.



The midbrain lies predominantly within the posterior cranial fossa. The aperture in the tentorium cerebelli lies on its dorsal surface. The midbrain receives its blood supply from the posterior cerebral and superior cerebellar arteries (ex-basilar). Dopaminergic cells sit within the midbrain within the substantia nigra; loss of dopaminergic neurons is the basis of Parkinson's disease.

The pons houses nuclei of the trigeminal nerve, the abducens nerve, the facial nerve and the vestibulocochlear nerve. This knowledge allows prediction of the clinical effects of a pontine haemorrhage:

- Abducens nucleus (lateral rectus paralysis)
- Vestibular nuclei (nystagmus, nausea, vomiting, vertigo)
- Cochlear nuclei (central nerve deafness)
- Trigeminal nuclei (paralysis of muscles of mastication, jaw deviation, loss of facial sensation)
- Facial nucleus (facial nerve paralysis and loss of taste sensation from anterior tongue)

The pons receives its blood supply from pontine branches of the basilar artery.

The medulla oblongata is the upward continuation of the spinal cord. It receives its blood supply from the posterior inferior cerebellar arteries and branches of the vertebral and basilar arteries.

Lateral medullary syndrome results from occlusion of the intracranial portion of the vertebral artery (most commonly) or of the posterior inferior cerebellar artery (PICA). The resultant structures affected are the:

- Vestibular nuclei (nystagmus, nausea, vomiting, vertigo)
- Inferior cerebellar peduncle (cerebellar signs)
- Nucleus ambiguus of glossopharyngeal and vagus nerve (ipsilateral laryngeal, pharyngeal and palatal paralysis with dysarthria, dysphagia, dysphonia)
- Spinothalamic tracts (contralateral loss of pain and temperature from trunk and limbs)
- Spinal trigeminal nucleus and tract (ipsilateral loss of pain and temperature from face)
- Descending sympathetic tract (ipsilateral Horner's syndrome)

Medial medullary syndrome results from occlusion of small perforating branches from the vertebral or proximal basilar artery such as the anterior spinal artery. The resultant structures affected are the:

- Corticospinal tract (contralateral hemiparesis of trunk and extremities)
- Medial lemniscus (contralateral loss of proprioception, two-point discrimination and vibration of trunk and limbs)
- Hypoglossal nerve roots (ipsilateral flaccid paralysis of tongue)

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 109 of 142



The two cerebral hemispheres are connected by which of the following structures:

- ☒ a Internal capsule
- ☐ b Corpus callosum
- ☐ c Aqueduct
- ☐ d Medulla oblongata
- ☐ e Substantia nigra

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Current Question

110 ...

111 ...

112 ...

113 ...

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 109 of 142



☒ The two cerebral hemispheres are connected by which of the following structures:

- a) Internal capsule
- b) **Corpus callosum** ✓
- c) Aqueduct
- d) Medulla oblongata
- e) Substantia nigra

Answer

The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum.

Notes

Overview of the brain

The major parts of the developed brain are:

- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

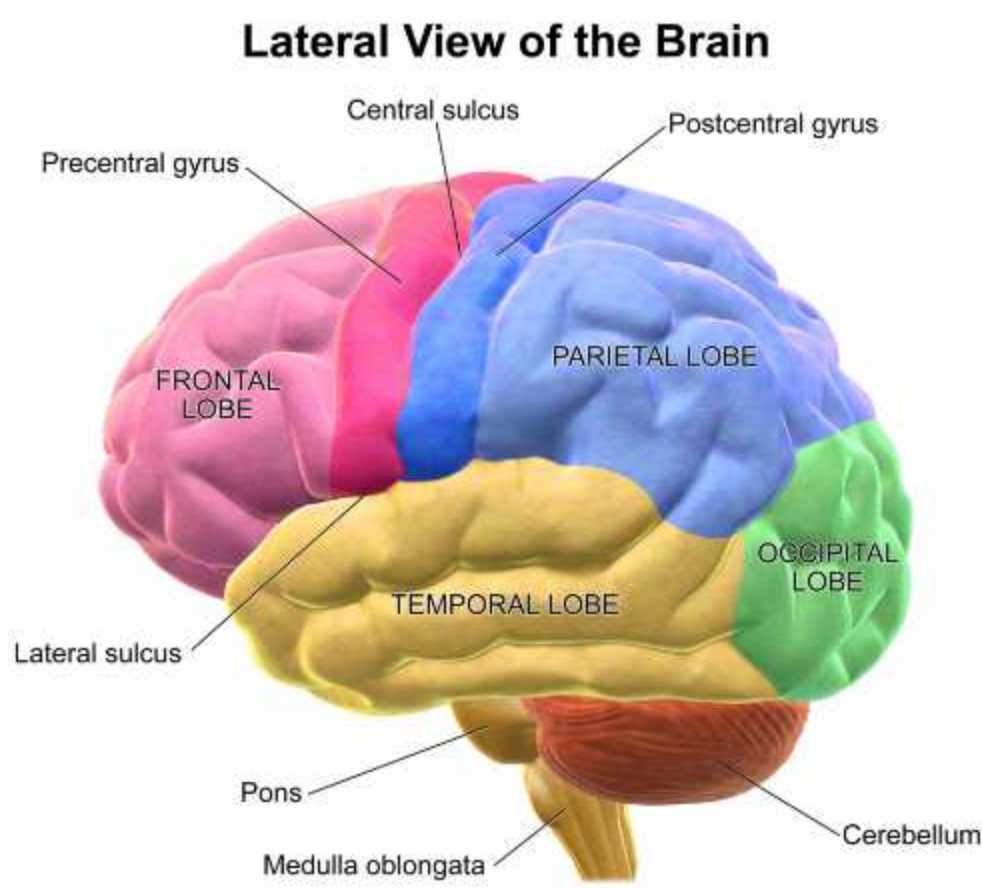
Cerebral cortex

The cerebral hemispheres are covered in a thin layer of grey matter called the cerebral cortex which is folded into gyri (elevations) and separated by sulci (depressions). The left and right hemispheres are partially separated by a deep longitudinal fissure (and the falx cerebri of the dura mater which extends into the fissure). The two cerebral hemispheres are connected by a white matter structure, called the corpus callosum which is composed primarily of commissural fibres.

Cerebral lobes

The cerebral hemispheres fill the area of the skull above the tentorium cerebelli and are subdivided into lobes based on their position relative to the major sulci:

- Frontal lobe – anterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the frontal pole)
- Parietal lobe – posterior to the central sulcus and superior to the lateral sulcus (extends from the central sulcus to the occipital lobe, lies superior to the temporal lobe)
- Temporal lobe – inferior to the lateral sulcus (extends from the temporal pole to the occipital lobe)
- Occipital lobe – posteroinferior to the parieto-occipital sulcus



By BruceBlaus (Own work) [CC BY 3.0 (<http://creativecommons.org/licenses/by/3.0/>)], via Wikimedia Commons

Basal nuclei

The basal nuclei (ganglia) are positioned within the lateral forebrain and function as a supraspinal control centre for skeletal muscle movement. They include the caudate nucleus, putamen and globus pallidus. The basal nuclei are strongly interconnected with the cerebral cortex, thalamus, and brainstem, as well as several other brain areas. The basal ganglia are highlighted green in the image below.

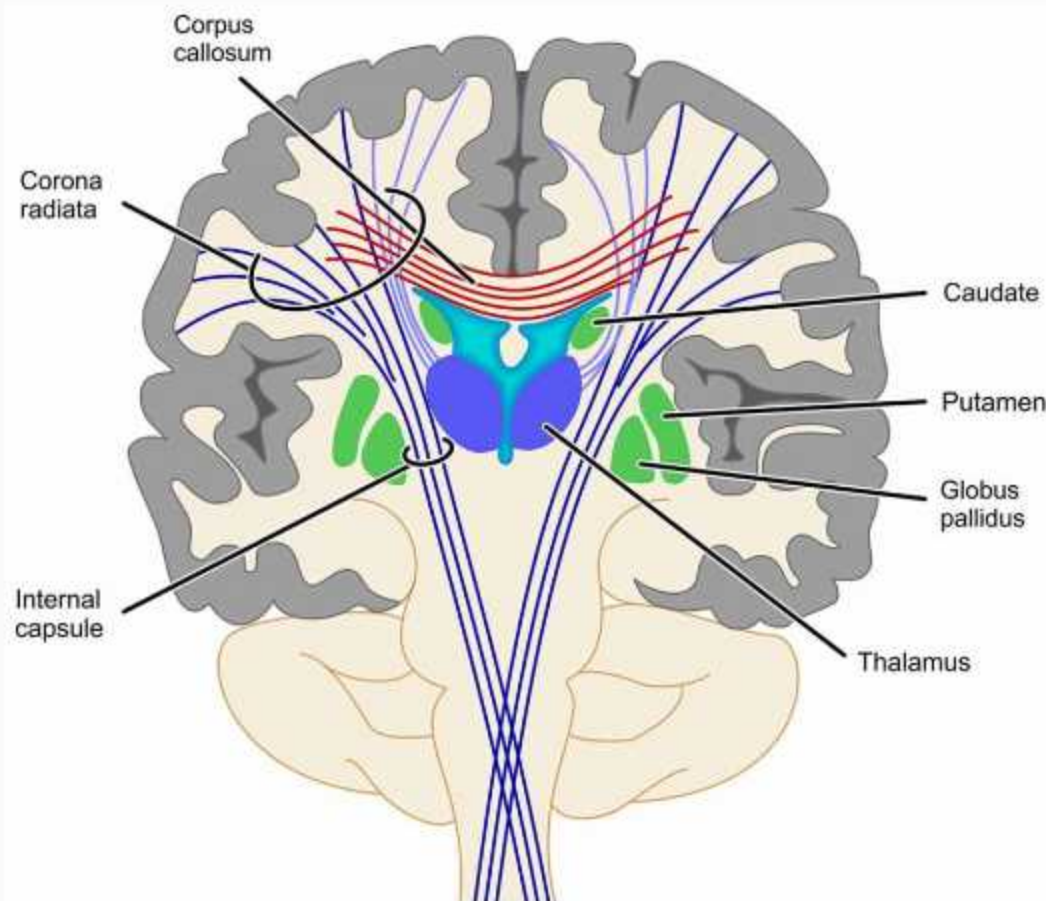
White matter

The white matter of the cerebral hemispheres basically contains two components; myelinated nerve fibres and neuroglia. It consists of three types of tracts:

- Commissural fibres which interconnect the corresponding regions of the two cerebral hemispheres (i.e. the corpus callosum and anterior commissure)
- Association fibres which connect the various cortical regions within a cerebral hemisphere allowing cortical coordination
- Projection fibres which connect the cerebral cortex with the lower part of the brain or brainstem and the spinal cord, in both directions

Internal capsule

Most projection fibres (both ascending and descending) pass through the internal capsule, a layer of white matter which separates the caudate nucleus and the thalamus medially from the lentiform nucleus (putamen and globus pallidus) laterally. This is clinically important as the internal capsule is particularly susceptible to infarction or compression from haemorrhagic intraparenchymal bleeds. Capsular infarct can result in a pure motor stroke with contralateral motor weakness and upper motor neuron signs, or a mixed sensorimotor stroke.



By Moeller K, Willmes K and Klein E [CC BY 4.0 (<http://creativecommons.org/licenses/by/4.0/>)], via Wikimedia Commons

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 110 of 142

The primary visual cortex is located in which of the following regions:



- ☐ a Occipital lobe
- ☐ b Parietal lobe
- ☐ c Frontal lobe
- ☐ d Temporal lobe
- ☐ e Brainstem

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Current Question

111 ...

112 ...

113 ...

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 110 of 142

The primary visual cortex is located in which of the following regions:

- a) Occipital lobe
- b) Parietal lobe
- c) Frontal lobe
- d) Temporal lobe
- e) Brainstem

Answer

The primary visual cortex is located within the occipital lobe and together with the visual association cortex is responsible for vision.

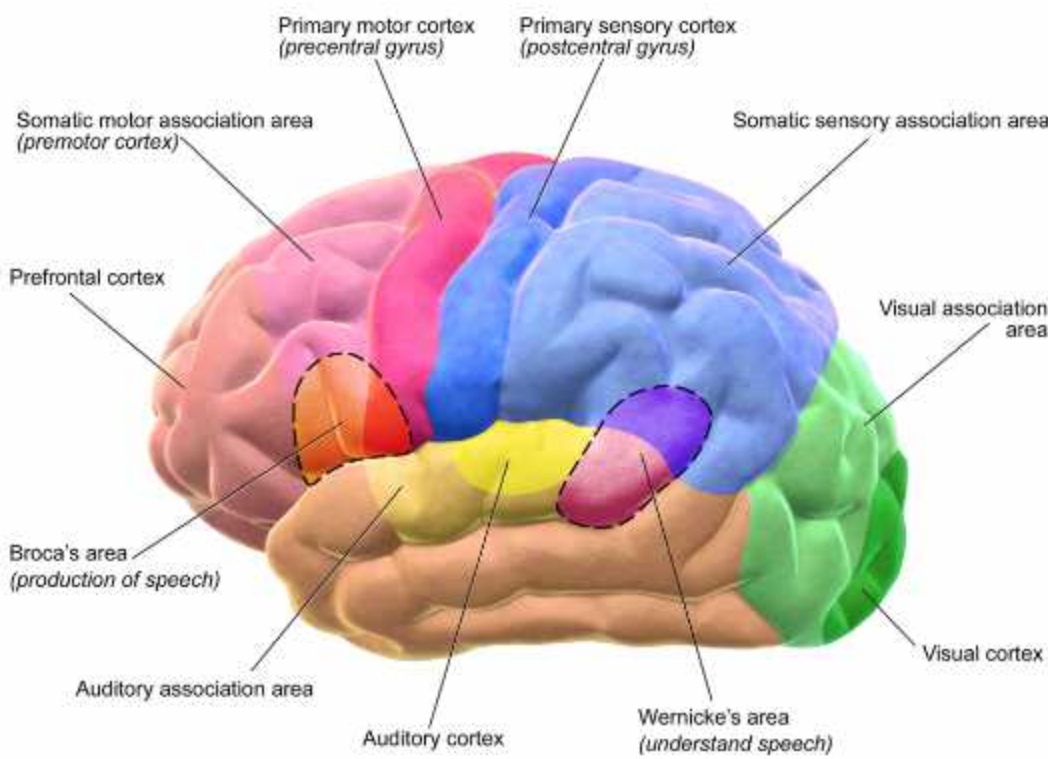
Notes

The occipital lobe rests inferiorly upon the tentorium cerebelli which segregates the cerebrum from the cerebellum. The parieto-occipital sulcus separates the occipital lobe from the parietal and temporal lobes anteriorly.

Areas of the occipital lobe

The primary visual cortex is located within the occipital lobe and together with the visual association cortex is responsible for vision.

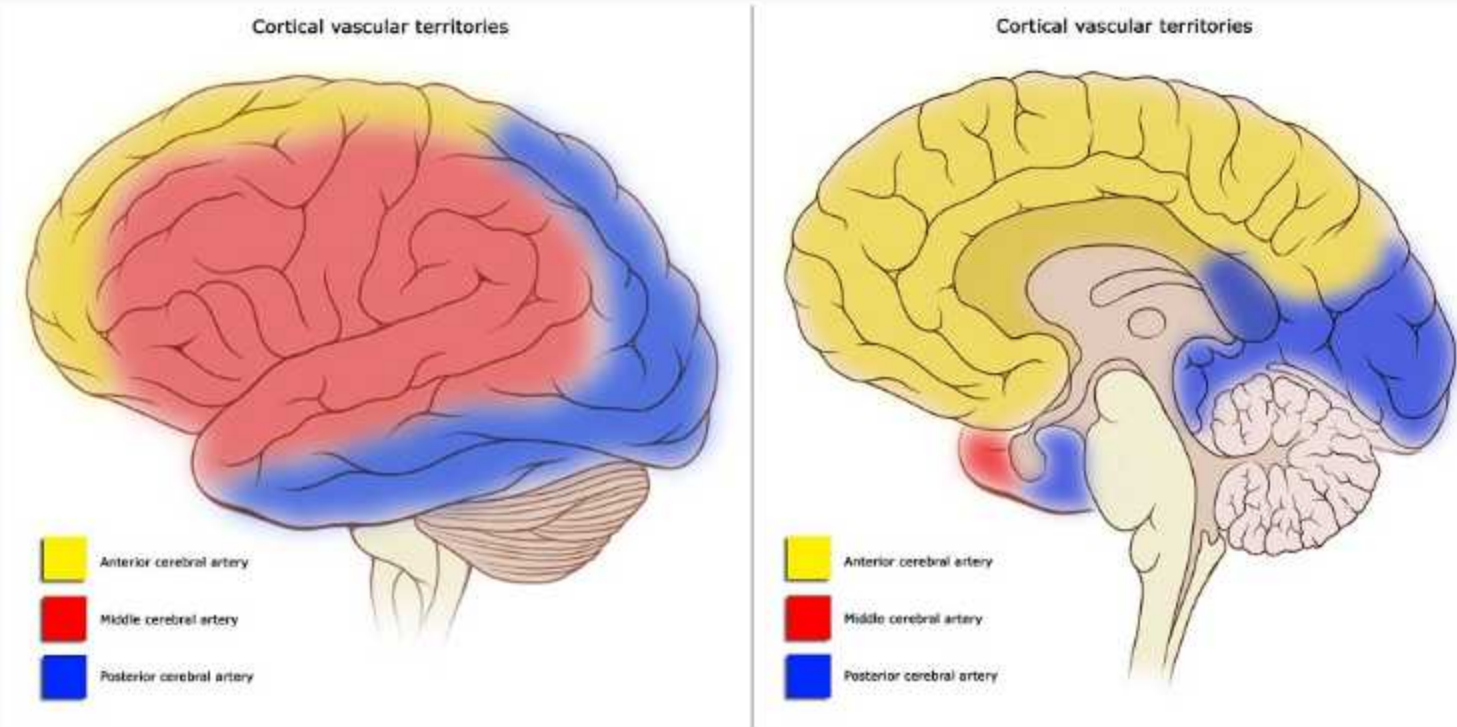
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the occipital lobe is from the posterior cerebral artery, but the occipital poles, serving macular vision, have additional supply from a branch of the middle cerebral artery.



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the occipital lobe can result in:

- Contralateral homonymous hemianopia (with macular sparing)
- Cortical blindness
- Visual agnosia
- Colour blindness
- Visual illusions or hallucinations
- Difficulty reading and writing

< Previous Next >

Something wrong?

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Current Question
111	...
112	...
113	...
114	...
115	...
116	...
117	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 111 of 142



A 55 year old woman presents to ED complaining of headaches. On examination the patient is found to have weakness of the left side of her body and her eyes are deviated towards the right hand side. The lesion is most likely to be in the:

- ☐ a Frontal lobe
- ☐ b Occipital lobe
- ☐ c Temporal lobe
- ☐ d Parietal lobe
- ☐ e Cerebellum

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Current Question

112 ...

113 ...

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 111 of 142



A 55 year old woman presents to ED complaining of headaches. On examination the patient is found to have weakness of the left side of her body and her eyes are deviated towards the right hand side. The lesion is most likely to be in the:

- a) Frontal lobe
- b) Occipital lobe
- c) Temporal lobe
- d) Parietal lobe
- e) Cerebellum

Answer

Contralateral weakness of the body results from damage to the primary motor cortex, in this case the right side. Conjugate eye deviation towards the side of the lesion results from damage to the frontal eye field.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

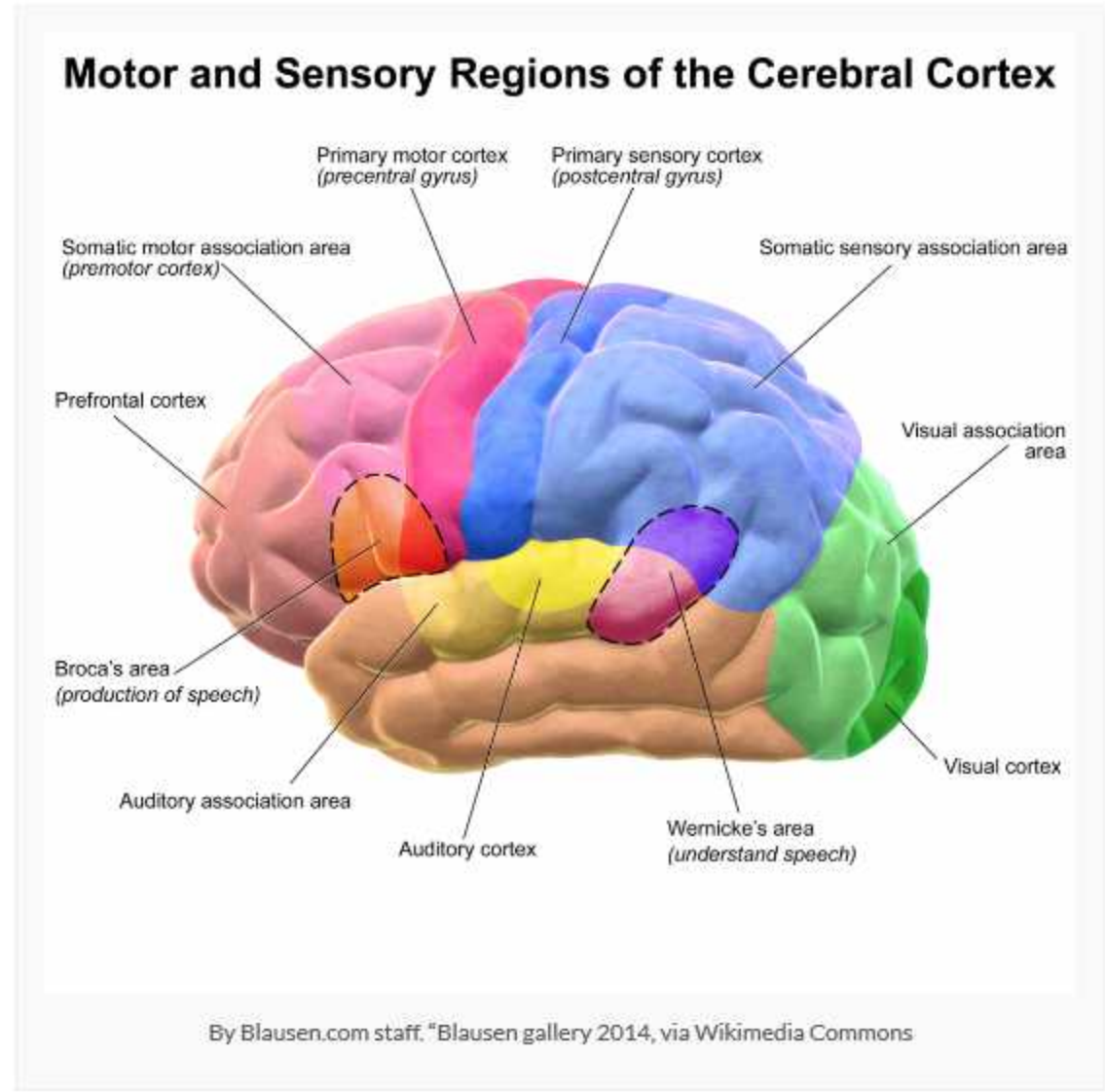
Areas of the frontal lobe are responsible for:

- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

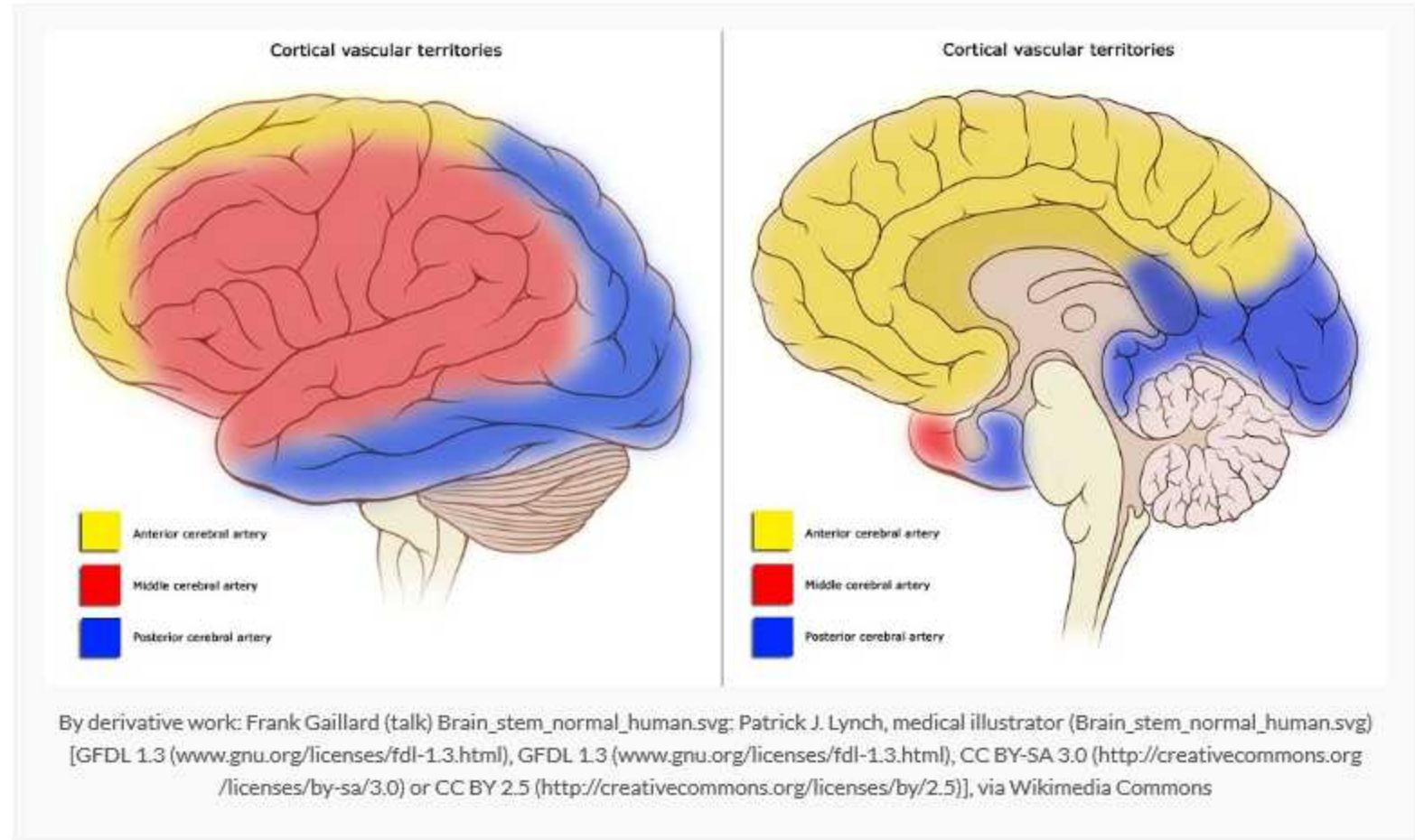
Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.



Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Answered
111	Current Question
112	...
113	...
114	...
115	...
116	...
117	...

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 112 of 142



Which of the following best describes the function of the cerebral aqueduct:

- ☐ a Major site of production of CSF
- ☐ b Connects the lateral ventricles to the third ventricle
- ☐ c Drains CSF into the subarachnoid cisterns
- ☐ d Connects the third ventricle to the fourth ventricle
- ☐ e Connects the right and left lateral ventricles

< Previous

Next >

See Answer

Something wrong?

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Answered

112 Current Question

113 ...

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 112 of 142

Which of the following best describes the function of the cerebral aqueduct:

- a) Major site of production of CSF
- b) Connects the lateral ventricles to the third ventricle
- c) Drains CSF into the subarachnoid cisterns
- d) Connects the third ventricle to the fourth ventricle
- e) Connects the right and left lateral ventricles

Answer

The third ventricle is connected to the fourth ventricle by the cerebral aqueduct.

Notes

The ventricles are a set of communicating cavities within the brain that are responsible for the production, transport and removal of cerebrospinal fluid (CSF), which bathes the central nervous system. Total CSF volume is about 130 ml, of which the majority is in the subarachnoid space.

CSF functions

CSF has three main functions:

- 1) Protection – acting as a cushion for the brain
- 2) Buoyancy – reducing the net weight of the brain to prevent excessive pressure on the base of the brain
- 3) Chemical stability – creating the right chemical environment to allow proper functioning of the brain

CSF production

CSF is secreted by the ventricular choroid plexuses, which are vascular conglomerates of capillaries, pial and ependymal cells. The bulk of CSF arises from the plexuses of the lateral ventricles.

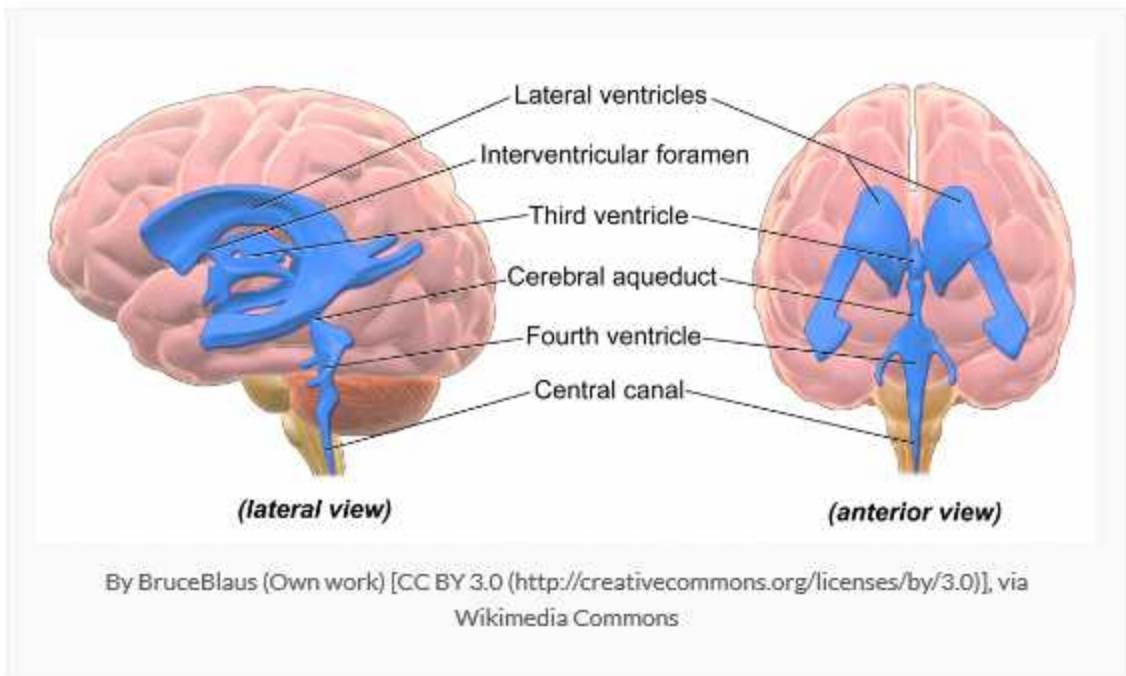
CSF transport in the ventricles

In total there are four ventricles; right and left lateral ventricles, the third ventricle and the fourth ventricle. In cross sectional radiology, the midline cavities (third and fourth ventricles and the aqueduct) are symmetrical, but the lateral ventricles (the cavities of the hemispheres) are not.

The lateral ventricles are C-shaped cavities located within their respective hemispheres of the cerebrum. They are divided into a body, an anterior horn (projecting into the frontal lobe), an inferior horn (projecting into the temporal lobe) and a posterior horn (projecting into the occipital lobe). The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

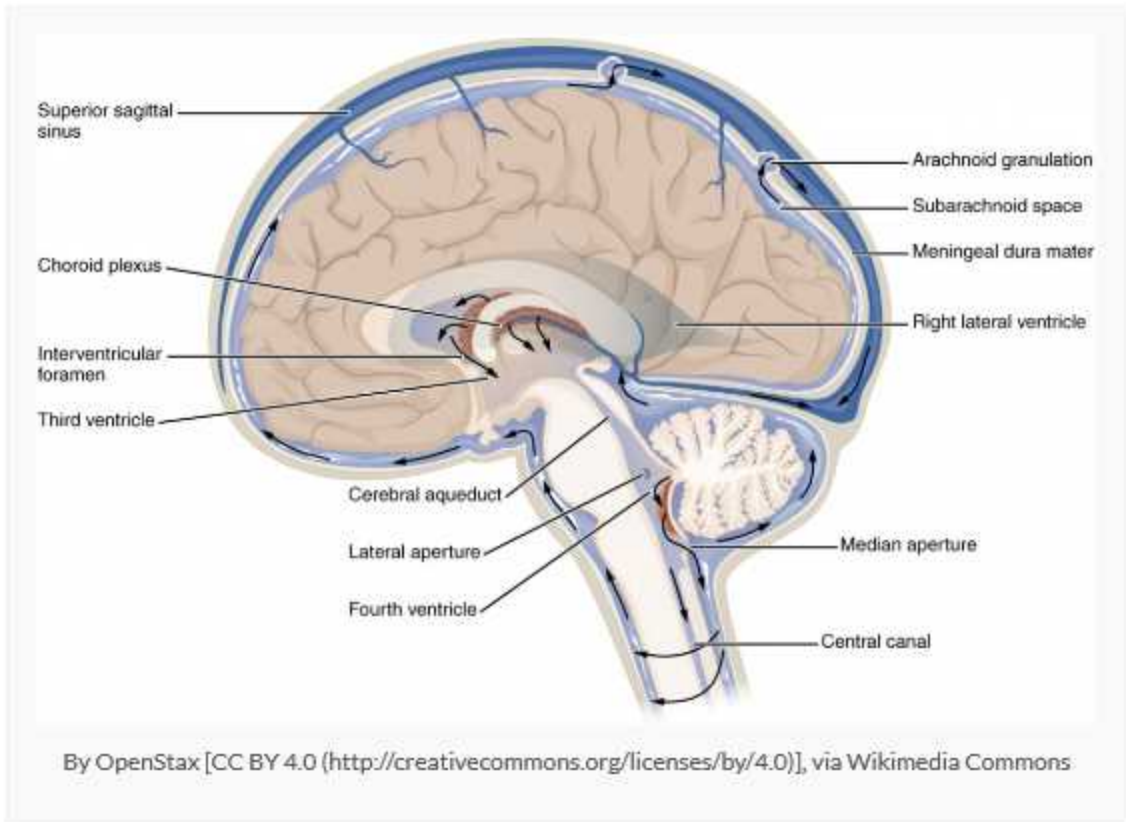
The third ventricle is a slit-like space in the sagittal plane, situated between the right and left thalamus and superior to the hypothalamus. The third ventricle is connected to the fourth ventricle by the cerebral aqueduct.

The fourth ventricle lies within the brainstem, at the junction between the pons and the medulla oblongata.



CSF removal

From the fourth ventricle, the CSF drains into the central spinal canal (bathing the spinal cord) and the subarachnoid cisterns in the subarachnoid space located between the arachnoid mater and pia mater (bathing the brain). From the subarachnoid cisterns, CSF is reabsorbed via arachnoid granulations which protrude into the dura mater, into the dural venous sinuses and from here back into the circulation.



There is small but significant CSF drainage via the cribriform plate of the ethmoid into the nasal tissues. Fracture of the cribriform plate results in CSF rhinorrhoea.

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Answered
111	Answered
112	Current Question
113	...
114	...
115	...
116	...
117	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 113 of 142



Regarding the trigeminal nerve, which of the following statements is **INCORRECT**:

- ☐ a The trigeminal nerve is the largest cranial nerve.
- ☐ b The trigeminal nerve has both motor and sensory function.
- ☐ c The trigeminal nerve is the afferent nerve for the corneal blink reflex.
- ☐ d All three divisions of the trigeminal nerve have bilateral cortical representation.
- ☐ e In a trigeminal nerve palsy, the jaw will deviate away from the affected side when open.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Answered

112 Answered

113 Current Question

114 ...

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 113 of 142



Regarding the trigeminal nerve, which of the following statements is INCORRECT:

- a) The trigeminal nerve is the largest cranial nerve.
- b) The trigeminal nerve has both motor and sensory function.
- c) The trigeminal nerve is the afferent nerve for the corneal blink reflex. ✖
- d) All three divisions of the trigeminal nerve have bilateral cortical representation.
- e) In a trigeminal nerve palsy, the jaw will deviate away from the affected side when open. ✔

Answer

In a trigeminal nerve palsy, the jaw will deviate towards the paralysed side due to unopposed action of the opposite lateral pterygoid.

Notes

The trigeminal nerve (CN V) is the largest cranial nerve, originating from three sensory nuclei and one motor nucleus extending from the midbrain to the medulla and exiting the brainstem from the pons.

Cranial nerve	Trigeminal nerve (CN V)
Key anatomy	Arises from several nuclei in the brainstem, exits brainstem from pons
Sensory function	Face, oral and nasal cavities, frontal sinus, external ear, afferent pathway of corneal reflex
Motor function	Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, anterior belly of digastric, parasympathetic fibres to lacrimal and nasal glands
Assessment	Sensation of face, jaw jerk, corneal blink reflex, power/bulk of muscles of mastication
Clinical effects of injury	Flaccid paralysis of muscles of mastication, jaw deviation towards affected side, loss of sensation to face, loss of afferent corneal reflex, loss of jaw jerk
Causes of injury	Trauma, anaesthetic block, tumours, cavernous sinus disease

Function

The trigeminal nerve is a mixed motor and sensory nerve. It has three main divisions:

- V1 ophthalmic
- V2 maxillary
- V3 mandibular

The trigeminal nerve supplies:

- Sensation to the face, mucous membranes of the nasal and oral cavities and frontal sinus, teeth, hard palate, soft palate and deep structures of the head (proprioception from muscles and the TMJ), the dura of the anterior and middle cranial fossa and the external ear
- The afferent pathway for the corneal reflex
- The muscles of mastication (temporalis, masseter, lateral and medial pterygoids)
- The tensor tympani muscle of the middle ear
- The tensor veli palatini muscle of the soft palate
- The mylohyoid and the anterior belly of the digastric muscles
- Parasympathetic fibres to lacrimal and nasal glands

Clinical implications

CN V palsy results in:

- Flaccid paralysis of the muscles of mastication
- Jaw deviation to the paralysed side. (due to unopposed action of the opposite lateral pterygoid)
- Loss of sensation over the areas innervated by the three divisions of the trigeminal nerve
- Loss of the corneal reflex (afferent pathway)
- Loss of jaw jerk
- Paralysis of tensor tympani muscle leading to hypoacusis

The trigeminal nerve may be damaged by:

- Fractures of the middle third of the face (V2)
- Trauma to the mandible (V3)
- Anaesthetic block of the inferior alveolar nerve (V3)
- Basal skull fractures
- Tumours e.g. of the maxillary antrum and nasopharynx (V3)
- Cavernous sinus pathology (V1)
- Trigeminal neuralgia (sensory disorder characterised by severe shooting pains usually in the distribution of V2 or V3)

All three branches have bilateral cortical representation so a unilateral central lesion, for example a stroke, does not usually produce a deficit.

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Answered
111	Answered
112	Answered
113	Current Question
114	...
115	...
116	...
117	...

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 114 of 142



Which of the following clinical features would you least expect to see in a lesion of the frontal lobe:

- ☐ a Conjugate eye deviation towards side of lesion
- ☐ b Contralateral weakness of the face and arm
- ☐ c Loss of two-point discrimination
- ☐ d Personality change
- ☐ e Expressive dysphasia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Answered

112 Answered

113 Answered

114 Current Question

115 ...

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 114 of 142



- Which of the following clinical features would you least expect to see in a lesion of the frontal lobe:
- a) Conjugate eye deviation towards side of lesion
 - b) Contralateral weakness of the face and arm
 - c) Loss of two-point discrimination ✓
 - d) Personality change
 - e) Expressive dysphasia ✗

Answer

Loss of two-point discrimination is most likely to occur in a lesion of the parietal lobe. Expressive dysphasia results from damage to Broca's area. Contralateral weakness of the face and arm results from damage to the primary motor cortex. Personality change results from damage to the prefrontal cortex. Conjugate eye deviation towards side of lesion results from damage to the frontal eye field.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

Areas of the frontal lobe are responsible for:

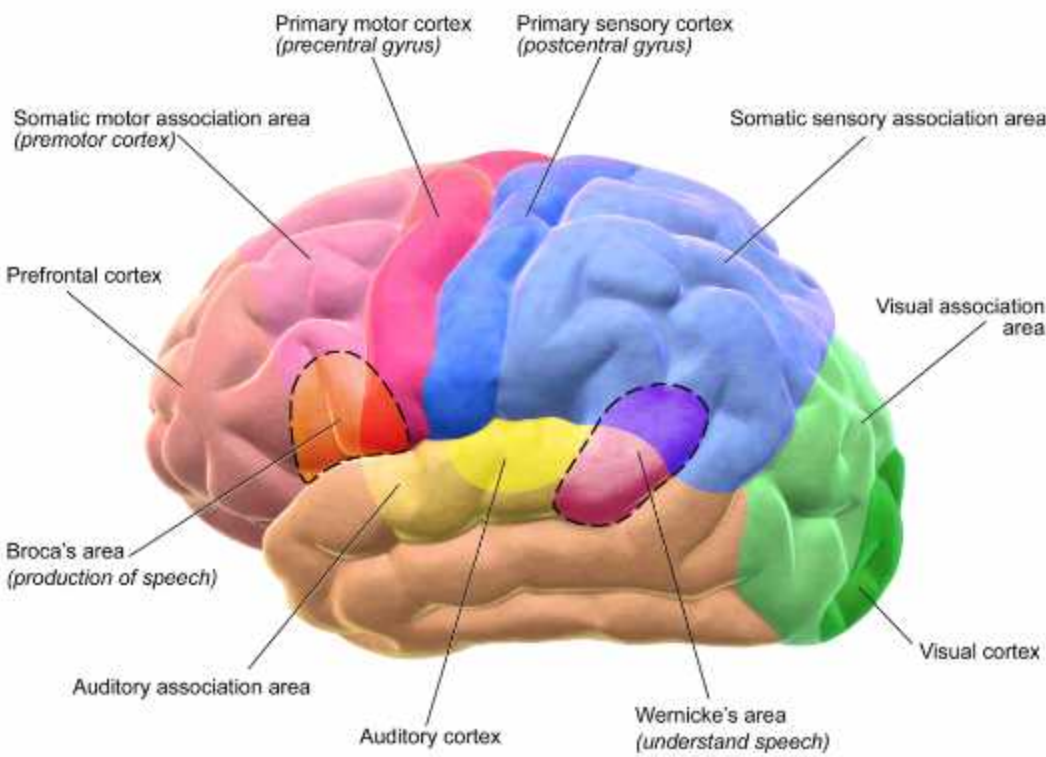
- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.

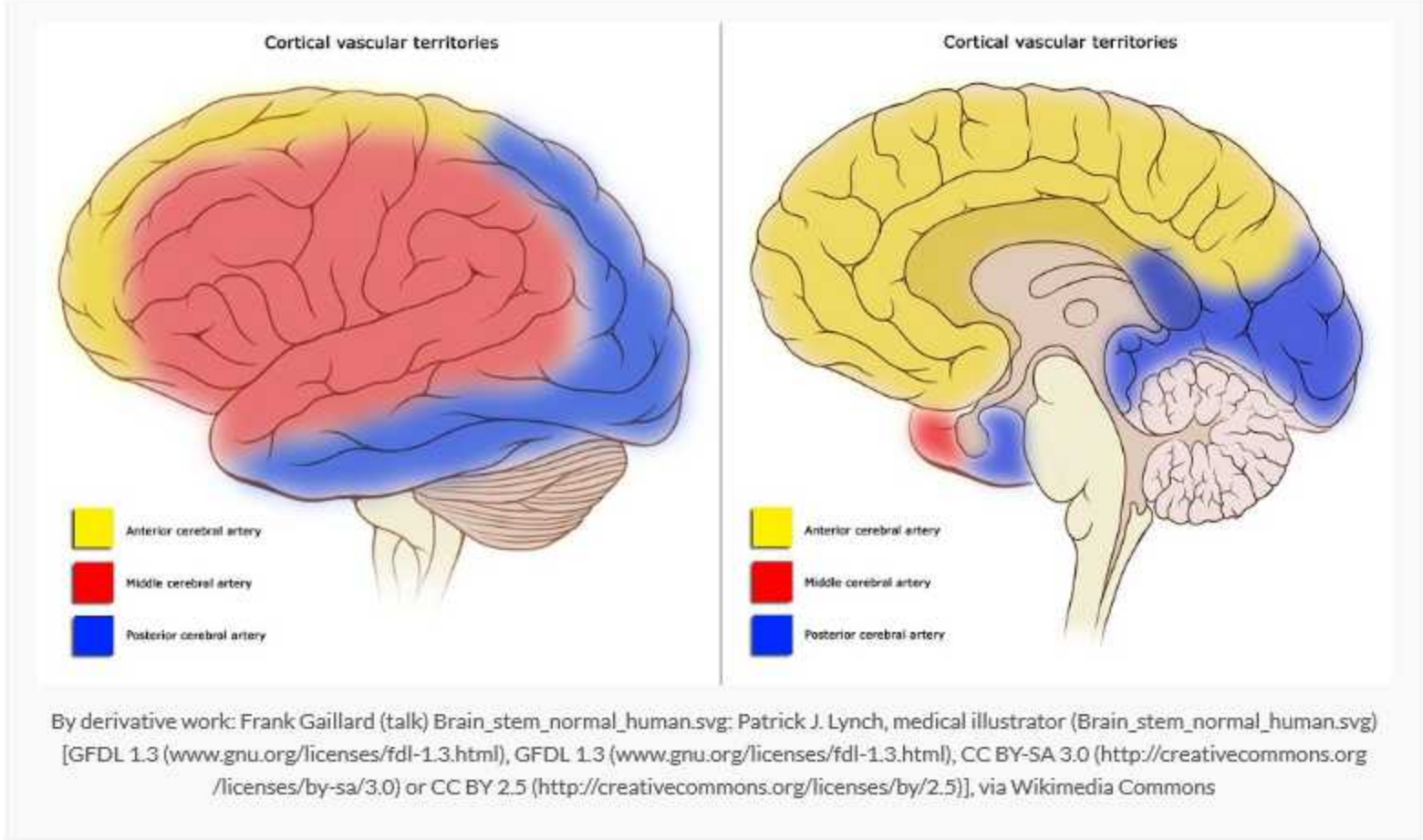
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg; Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

< Previous

Next >

Something wrong?

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Answered
111	Answered
112	Answered
113	Answered
114	Current Question
115	...
116	...
117	...

FRCEM Success

We are an online revision resource for FRCEM Primary and intermediate exam preparation.

Terms & Conditions
Get In Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 115 of 142



Cerebrospinal fluid is primarily produced by which of the following structures:

- ☐ a Cerebral aqueduct
- ☐ b Choroid plexus
- ☐ c Interventricular foramen of Monro
- ☐ d Subarachnoid cisterns
- ☐ e Arachnoid granulations

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Answered

112 Answered

113 Answered

114 Answered

115 Current Question

116 ...

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk





 Cerebrospinal fluid is primarily produced by which of the following structures:

- a) Cerebral aqueduct
- b) **Choroid plexus** ✓
- c) Interventricular foramen of Monro
- d) Subarachnoid cisterns
- e) Arachnoid granulations

CSF is primarily produced by a structure called the choroid plexus in the lateral, third and fourth ventricles (the vast majority from the lateral plexuses).

The ventricles are a set of communicating cavities within the brain that are responsible for the production, transport and removal of cerebrospinal fluid (CSF), which bathes the central nervous system. Total CSF volume is about 130 ml, of which the majority is in the subarachnoid space.

- 1) Protection – acting as a cushion for the brain
- 2) Buoyancy – reducing the net weight of the brain to prevent excessive pressure on the base of the brain
- 3) Chemical stability – creating the right chemical environment to allow proper functioning of the brain

CSF is secreted by the ventricular choroid plexuses, which are vascular conglomerates of capillaries, pial and ependymal cells. The bulk of CSF arises from the plexuses of the lateral ventricles.

The lateral ventricles are C-shaped cavities located within their respective hemispheres of the cerebrum. They are divided into a body, an anterior horn (projecting into the frontal lobe), an inferior horn (projecting into the temporal lobe) and a posterior horn (projecting into the occipital lobe). The lateral ventricles are connected to the third ventricle by the interventricular foramen (of Monro).

The third ventricle is a slit-like space in the sagittal plane, situated between the right and left thalamus and superior to the hypothalamus. The third ventricle is connected to the fourth ventricle by the cerebral aqueduct.

The fourth ventricle lies within the brainstem, at the junction between the pons and the medulla oblongata.



From the fourth ventricle, the CSF drains into the central spinal canal (bathing the spinal cord) and the subarachnoid cisterns in the subarachnoid space located between the arachnoid mater and pia mater (bathing the brain). From the subarachnoid cisterns, CSF is reabsorbed via arachnoid granulations which protrude into the dura mater, into the dural venous sinuses and from here back into the circulation.



There is small but significant CSF drainage via the cribriform plate of the ethmoid into the nasal tissues. Fracture of the cribriform plate results in CSF rhinorrhoea.

Something wrong?



- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- [Advanced Life Support Group](#)
- [Emergency Medicine Journal](#)
- [Lifeinthefastlane](#)
- [Instant Anatomy](#)
- [Patient.co.uk](#)



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 116 of 142

The oculomotor nerve supplies all of the following muscles EXCEPT for the:

- ☐ a Medial rectus
- ☐ b Lateral rectus
- ☐ c Superior rectus
- ☐ d Inferior rectus
- ☐ e Inferior oblique

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)


Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Answered

112 Answered

113 Answered

114 Answered

115 Answered

116 Current Question

117 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 116 of 142

The oculomotor nerve supplies all of the following muscles EXCEPT for the:

- a) Medial rectus
- b) Lateral rectus
- c) Superior rectus
- d) Inferior rectus
- e) Inferior oblique

Answer

The oculomotor nerve supplies four extraocular muscles – the inferior oblique, superior rectus, inferior rectus and medial rectus muscles. The superior oblique muscle is innervated by the trochlear nerve, and the lateral rectus muscle by the abducens nerve.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

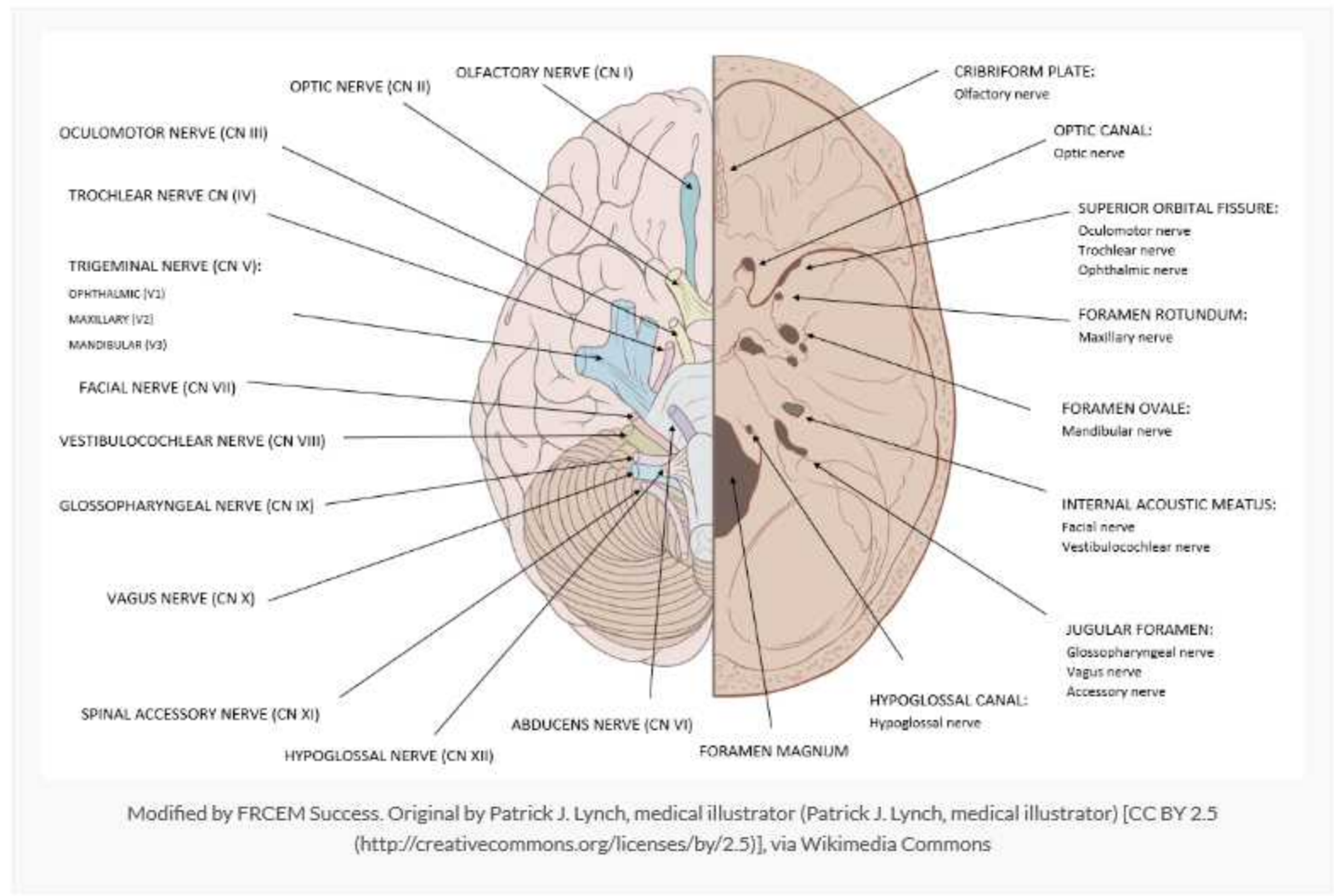
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Answered
111	Answered
112	Answered
113	Answered
114	Answered
115	Answered
116	Current Question
117	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 117 of 142



The glossopharyngeal nerve carries all of the following EXCEPT for:

- ☐ a Visceral afferent fibres from the carotid body and sinus
- ☐ b Sensory afferent fibres from the posterior one-third of the tongue
- ☐ c Sensory afferent fibres from the lower teeth and associated gingivae
- ☐ d Afferent taste fibres from the posterior one-third of the tongue
- ☐ e Motor fibres to the stylopharyngeus muscle

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

106 Answered

107 Answered

108 Answered

109 Answered

110 Answered

111 Answered

112 Answered

113 Answered

114 Answered

115 Answered

116 Answered

117 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 117 of 142

The glossopharyngeal nerve carries all of the following EXCEPT for:

- a) Visceral afferent fibres from the carotid body and sinus
- b) Sensory afferent fibres from the posterior one-third of the tongue
- c) Sensory afferent fibres from the lower teeth and associated gingivae
- d) Afferent taste fibres from the posterior one-third of the tongue
- e) Motor fibres to the stylopharyngeus muscle

Answer

The mandibular division of the trigeminal nerve carries sensory afferent fibres from the lower teeth and associated gingivae.

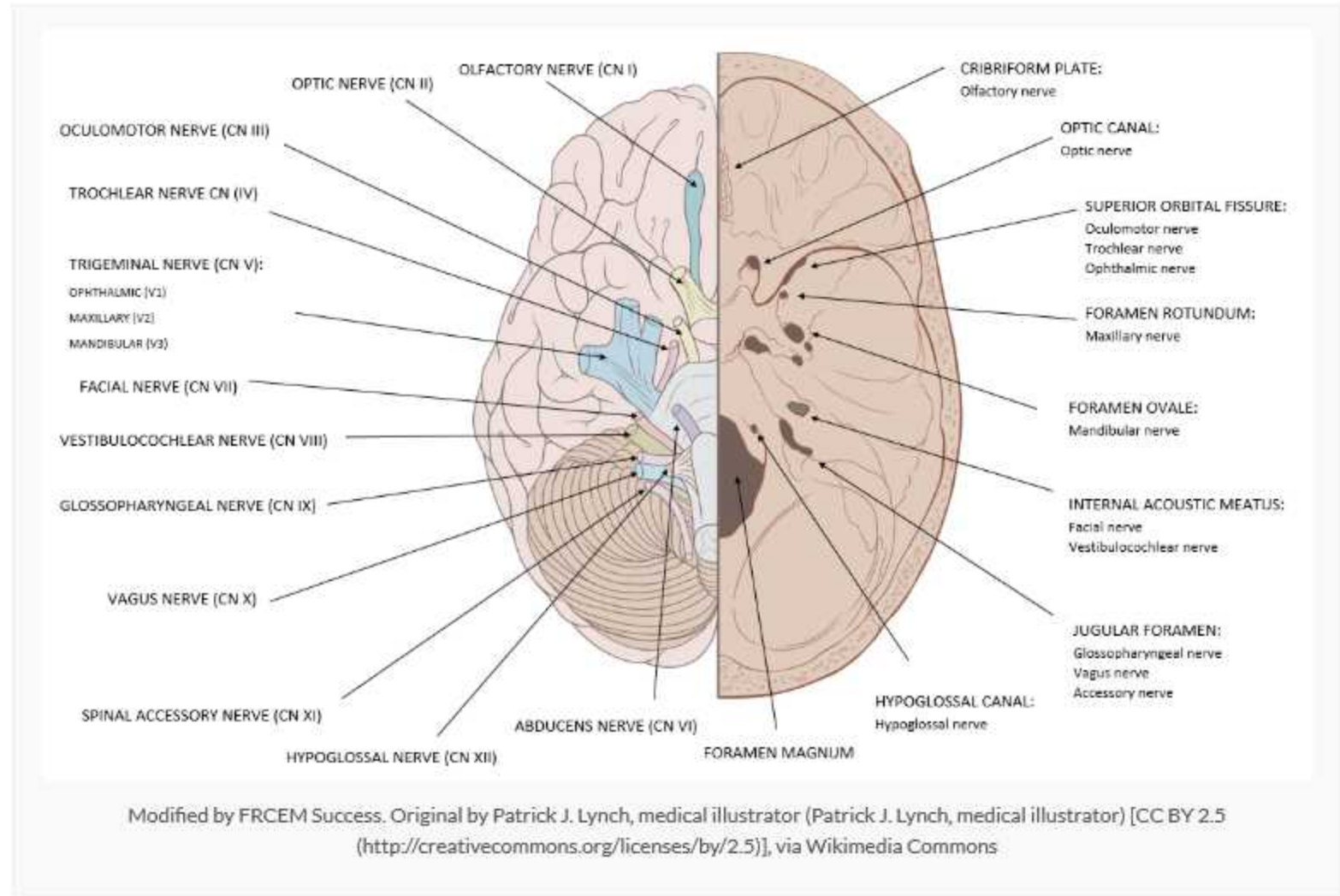
Notes

The glossopharyngeal nerve (CN IX) mediates taste, salivation and swallowing (together with CN X).

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Key anatomy

The glossopharyngeal nerve originates from the medulla and travels lateral in the posterior cranial fossa before emerging from the cranial cavity via the jugular foramen.



Function

The glossopharyngeal nerve carries:

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

Clinical implications

CN IX palsy will result in:

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

Isolated glossopharyngeal nerve palsy is rare. It is usually damaged with CN X and XI, close to the jugular foramen.

Causes of damage to CN IX include:

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Question Navigator

106	Answered
107	Answered
108	Answered
109	Answered
110	Answered
111	Answered
112	Answered
113	Answered
114	Answered
115	Answered
116	Answered
117	Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 118 of 142



What type of visual field defect are you likely to see in a lesion of the visual cortex:

- ☐ a Bitemporal hemianopia
- ☐ b Contralateral homonymous inferior quadrantanopia
- ☐ c Monocular blindness
- ☐ d Contralateral homonymous superior quadrantanopia
- ☐ e Homonymous hemianopia with macular sparing

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

117 Answered

118 Current Question

119 ...

120 ...

121 ...

122 ...

123 ...

124 ...

125 ...

126 ...

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 118 of 142

What type of visual field defect are you likely to see in a lesion of the visual cortex:

- Bitemporal hemianopia
- Contralateral homonymous inferior quadrantanopia
- Monocular blindness
- Contralateral homonymous superior quadrantanopia
- Homonymous hemianopia with macular sparing** ✓

Answer

A lesion of the visual cortex will result in a contralateral homonymous hemianopia with macular sparing.

Notes

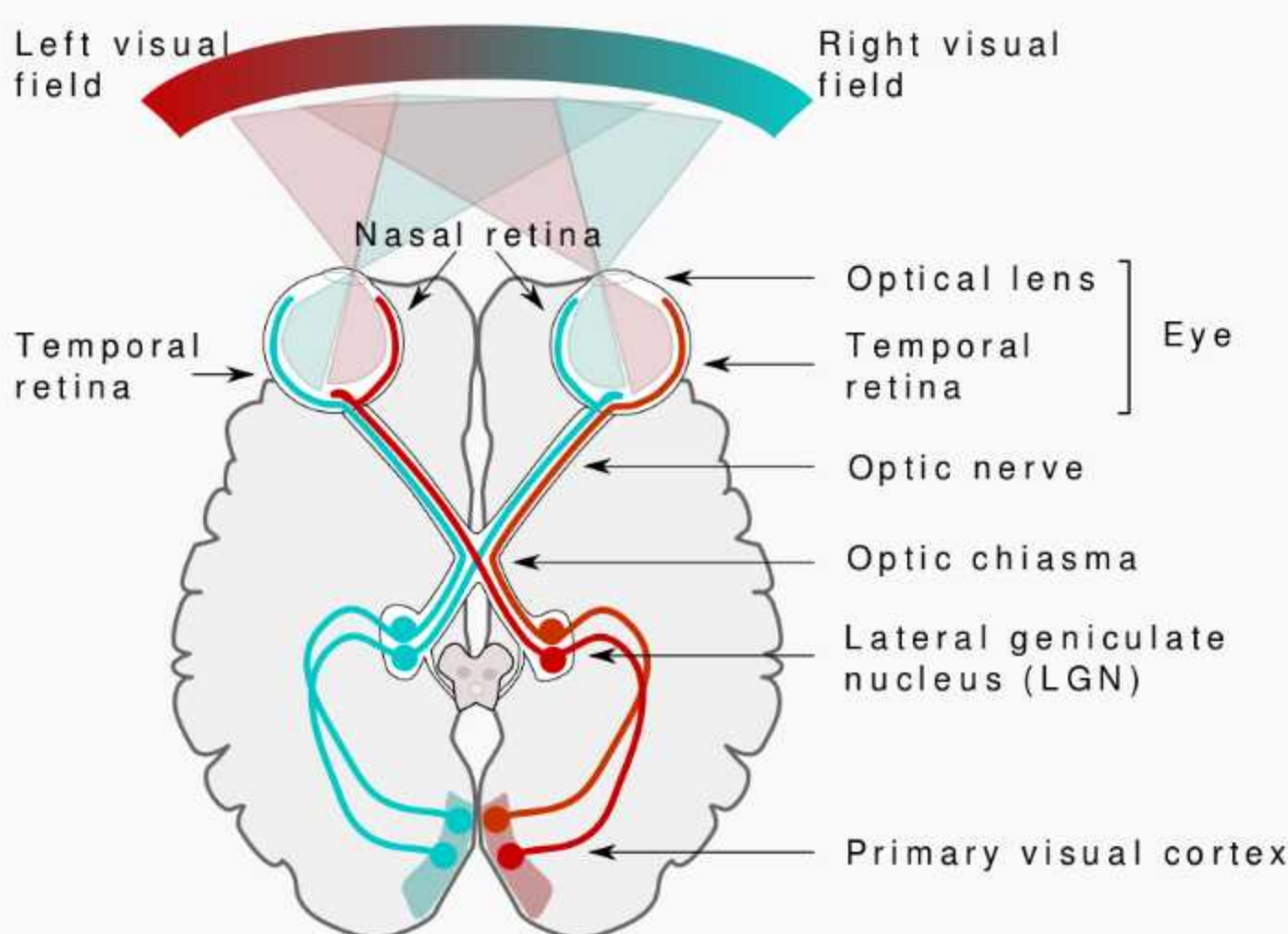
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (<http://creativecommons.org/licenses/by-sa/4.0/>)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

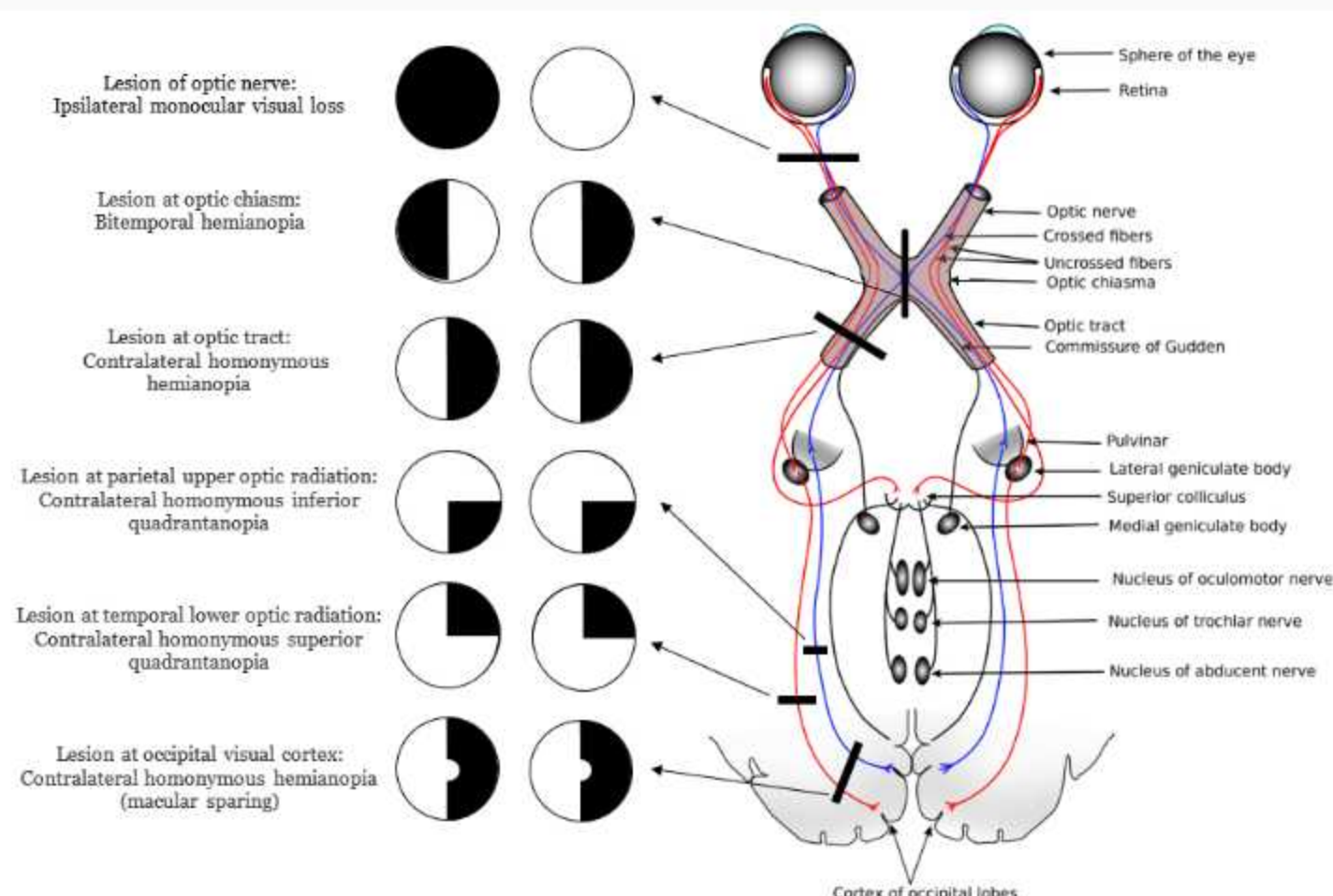
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 119 of 142



A patient undergoes maxillofacial surgery, during which the surgeon accidentally injures the facial nerve. Which of the following muscles is affected:

- ☐ a Masseter
- ☐ b Stylopharyngeus
- ☐ c Buccinator
- ☐ d Tensor tympani
- ☐ e Mylohyoid

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

117 Answered

118 Answered

119 Current Question

120 ...

121 ...

122 ...

123 ...

124 ...

125 ...

126 ...

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 119 of 142



A patient undergoes maxillofacial surgery, during which the surgeon accidentally injures the facial nerve. Which of the following muscles is affected:

- a) Masseter
- b) Stylopharyngeus
- c) Buccinator ☒
- d) Tensor tympani
- e) Mylohyoid ☒

Answer

The buccinator muscle is innervated by the facial nerve. The masseter, mylohyoid and tensor tympani muscles are innervated by the mandibular nerve. The stylopharyngeus is innervated by the glossopharyngeal nerve.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

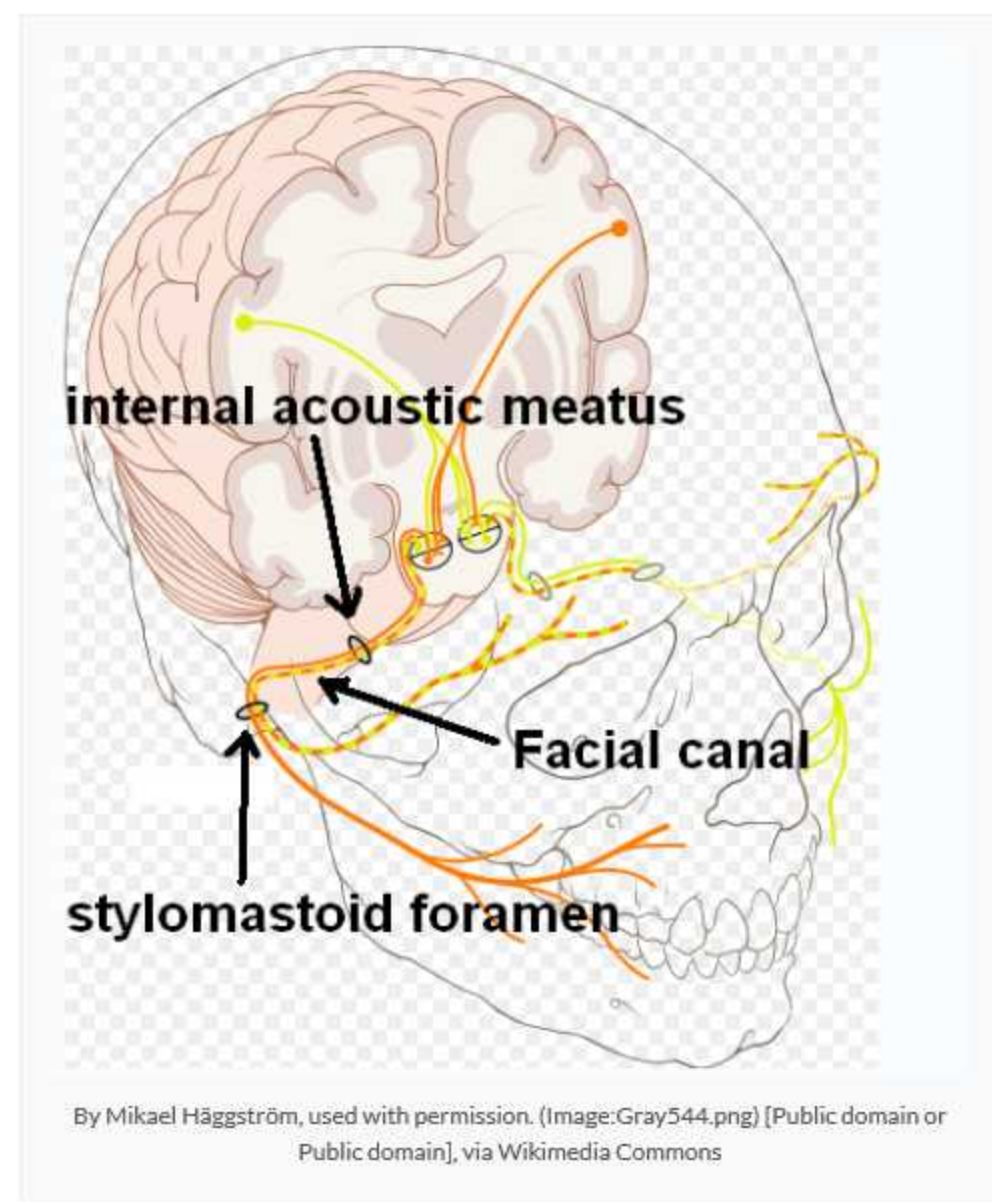
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

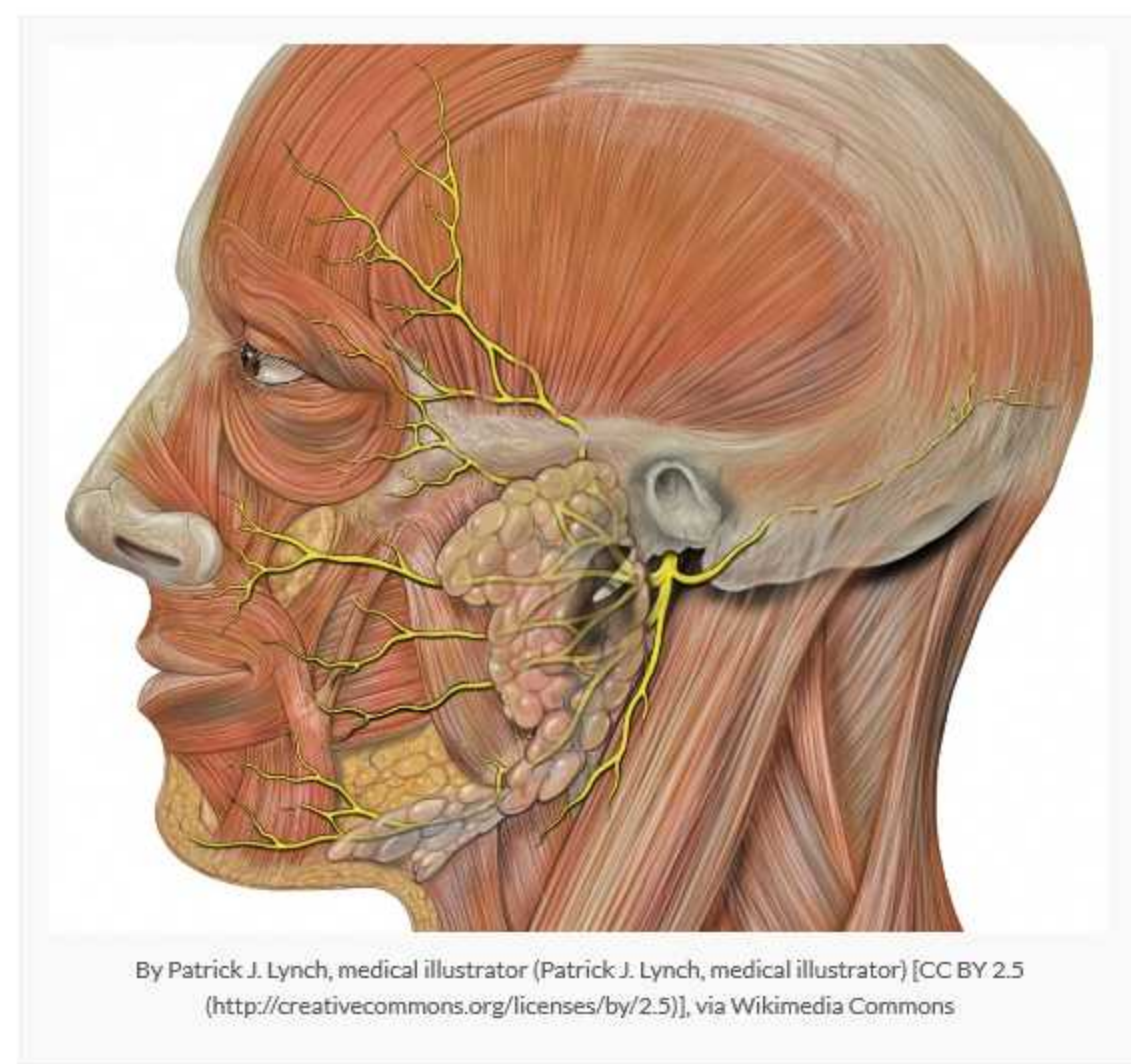
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and drooping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[< Previous](#)
[Next >](#)

Something wrong?

Question Navigator

117	Answered
118	Answered
119	Current Question
120	...
121	...
122	...
123	...
124	...
125	...
126	...
127	...
128	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 120 of 142



The Wernicke speech area is located in which of the following regions:

- ☐ a Occipital lobe
- ☐ b Parietal lobe
- ☐ c Frontal lobe
- ☐ d Temporal lobe
- ☐ e Brainstem

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

- 117 Answered
- 118 Answered
- 119 Answered
- 120 Current Question
- 121 ...
- 122 ...
- 123 ...
- 124 ...
- 125 ...
- 126 ...
- 127 ...
- 128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 120 of 142

The Wernicke speech area is located in which of the following regions:

- a) Occipital lobe
- b) Parietal lobe
- c) Frontal lobe
- d) Temporal lobe
- e) Brainstem

Answer

The Wernicke speech area, in the temporal lobe of the dominant hemisphere, is responsible for comprehension of written and spoken language. Damage to this area results in a receptive dysphasia.

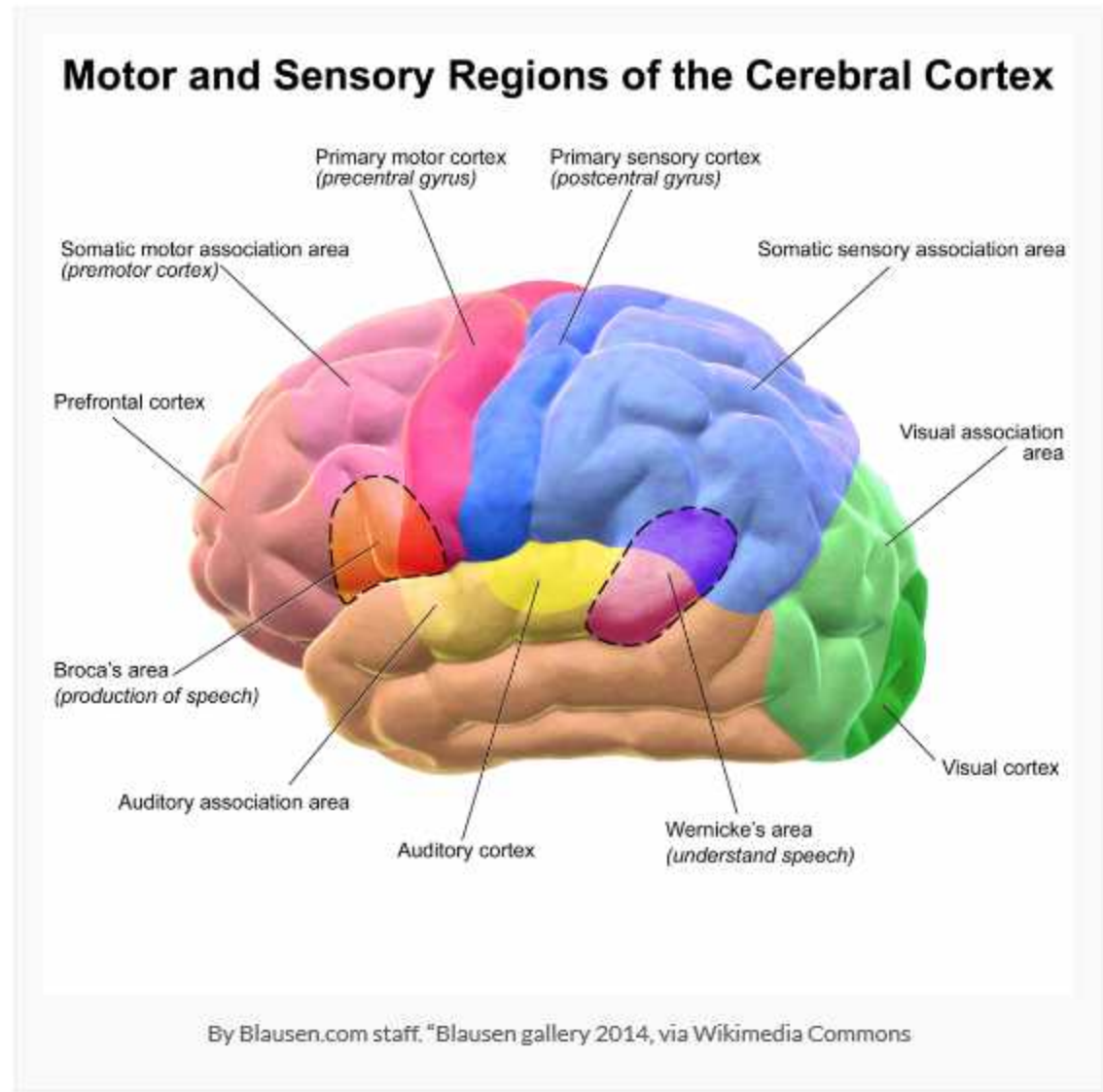
Notes

The temporal lobe extends from the temporal pole to the occipital lobe and lies inferior to the frontal and parietal lobes, from which it is separated by the lateral sulcus.

Area	Function	Lesion
Wernicke speech area	Language comprehension	Receptive dysphasia
Primary auditory cortex and auditory association area	Perception and recognition of auditory stimuli	Partial cortical deafness, auditory agnosia
Limbic association cortex	Memory, learning, emotion	Memory impairment, increased aggression, difficulty recognising faces/objects
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous superior quadrantanopia

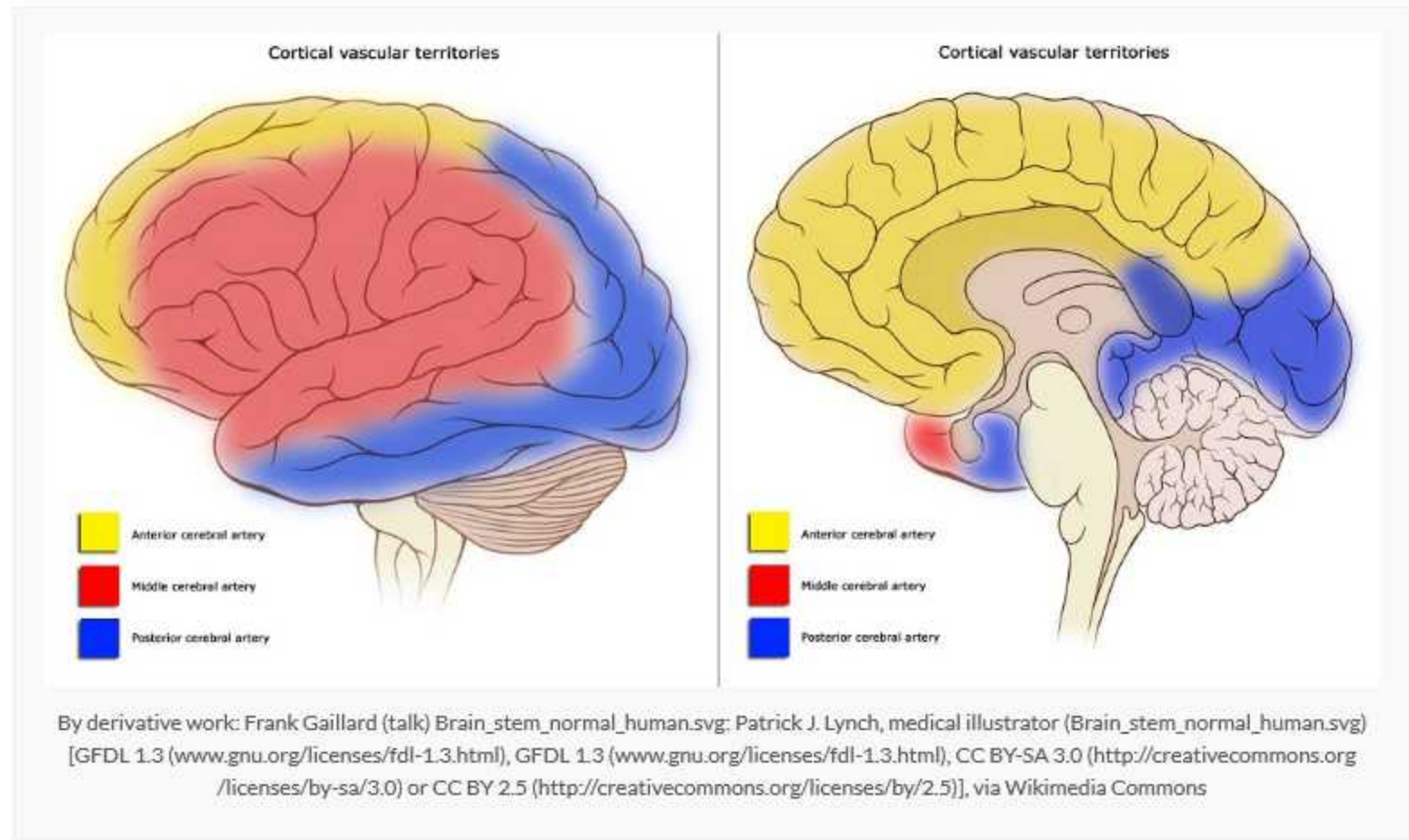
Areas of the temporal lobe

- The Wernicke speech area (in the dominant hemisphere only) is responsible for comprehension of written and spoken language. It is connected to the Broca speech area by the arcuate fasciculus.
- The primary auditory cortex and auditory association area are important for perception and recognition of auditory stimuli.
- The limbic association cortex is important in memory, learning and emotion.
- The fibres of the lower part of the optic radiation (serving the upper quadrant of the contralateral visual field) pass through the temporal lobe.



Blood supply

The blood supply to the temporal lobe is from the posterior cerebral artery (medial part of the lobe) and the middle cerebral artery (lateral part of the lobe).



Clinical implications

Damage to the temporal lobe may result in:

- Receptive dysphasia – damage to the Wernicke speech area
- Visual field defect (contralateral homonymous superior quadrantanopia) – damage to the optic radiation
- Memory impairment – damage to the limbic system
- Emotional and behavioural disturbances – damage to the limbic system
- Auditory agnosia – damage to the primary auditory cortex or auditory association areas
- Partial cortical deafness (due to bilateral cochlear representation) – damage to the primary auditory cortex

Question Navigator

117	Answered
118	Answered
119	Answered
120	Current Question
121	...
122	...
123	...
124	...
125	...
126	...
127	...
128	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 121 of 142



Which of the following clinical features is most suggestive of a lesion of the parietal lobe:

- ☐ a Contralateral limb weakness
- ☐ b Homonymous hemianopia
- ☐ c Expressive dysphasia
- ☐ d Hemispatial sensory neglect
- ☐ e Receptive dysphasia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

117 Answered

118 Answered

119 Answered

120 Answered

121 Current Question

122 ...

123 ...

124 ...

125 ...

126 ...

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 121 of 142



Which of the following clinical features is most suggestive of a lesion of the parietal lobe:

- a) Contralateral limb weakness
- b) Homonymous hemianopia
- c) Expressive dysphasia
- d) Hemispatial sensory neglect
- e) Receptive dysphasia

Answer

Hemispatial sensory neglect is most likely to be associated with damage to the parietal lobe. Receptive dysphasia may be seen in damage to the Wernicke speech area in the temporal lobe. Expressive dysphasia may be seen in damage to the Broca speech area in the frontal lobe. Contralateral motor weakness is due to damage of the motor cortex of the frontal lobe. Homonymous hemianopia is most likely to occur in damage of the occipital lobe.

Notes

The parietal lobe lies between the frontal lobe anteriorly and the occipital lobe posteriorly, from which it is separated by the central sulcus and parieto-occipital sulcus, respectively. It sits superiorly in relation to the temporal lobe, being separated by the lateral sulcus.

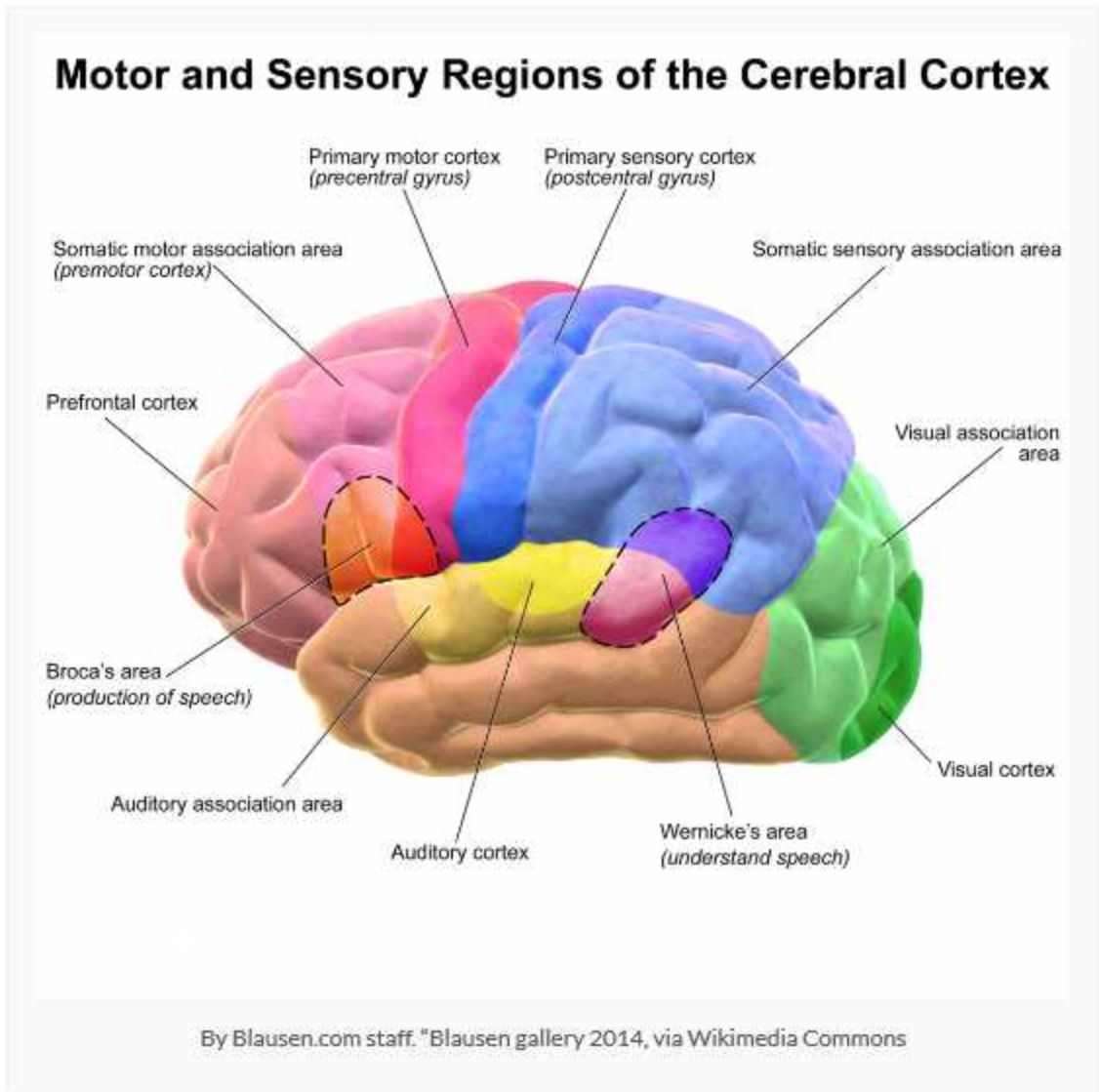
Areas of the parietal lobe are responsible for:

- Perceiving and interpreting sensation and proprioception
- Language and calculation of numbers on the dominant hemisphere side
- Integration of somatosensory, visual and auditory information and processing of visuospatial functions (e.g. 2-point discrimination) on the non-dominant hemisphere side

Area	Function	Lesion
Primary somatosensory cortex and somatosensory association cortex	Sensation and proprioception, visuo-spatial perception	Loss of sensation, difficulty distinguishing left from right, sensory neglect, apraxia, loss of hand-eye coordination, tactile agnosia
Arcuate fasciculus	Connects audiovisual association areas with Broca and Wernicke speech areas	Difficulties with reading, writing, naming, maths
Optic radiation	Carries visual information to primary visual cortex	Contralateral homonymous inferior quadrantanopia

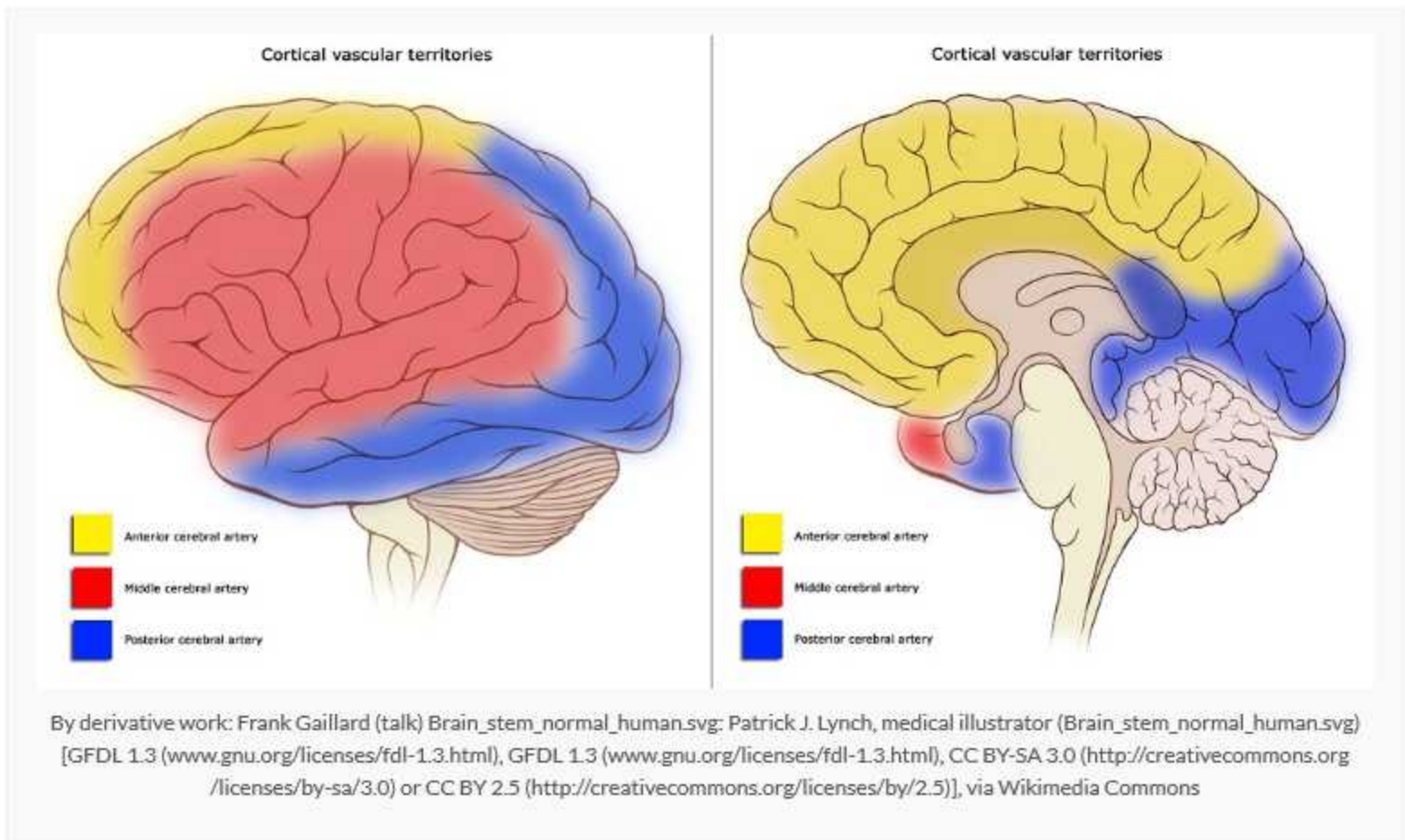
Areas of the parietal lobe

- The primary somatosensory cortex is located in the postcentral gyrus and is concerned with perceiving complex somatosensory stimuli from the contralateral side of the face and body. Together with the somatosensory association cortex, these areas are responsible for sensation and proprioception, and visuo-spatial perception.
- Pathways within the arcuate fasciculus are concerned with language as they connect Broca's area (frontal lobe) with Wernicke's area (temporal lobe).
- The fibres of the upper part of the optic radiation (serving the lower quadrant of the contralateral visual field) pass deep within the parietal lobe.



Blood supply

The blood supply to the parietal lobe is from the middle cerebral artery.



Clinical implications:

Damage to the parietal lobe may result in:

- Cortical contralateral sensory loss with loss of proprioception and two-point discrimination
- Apraxia
- Tactile agnosia
- Attention deficits e.g. contralateral hemispatial neglect syndrome (an inability to perceive a contralateral stimulus when two simultaneous sensory stimuli are applied with equal intensity to corresponding sites on opposite sides of the body)
- Visual field defect (contralateral homonymous inferior quadrantanopia)

Question Navigator

117	Answered
118	Answered
119	Answered
120	Answered
121	Current Question
122	...
123	...
124	...
125	...
126	...
127	...
128	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 122 of 142



A 64 year old man presents to ED with progressive hearing loss in his left ear, together with drooping of his left lip and complaints of food collecting in his left oral vestibule. Imaging shows a tumour compressing which of the following structures:

- ☐ a Hypoglossal canal
- ☐ b Internal auditory meatus
- ☐ c Foramen ovale
- ☐ d Foramen rotundum
- ☐ e Jugular foramen

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

[117 Answered](#)
[118 Answered](#)
[119 Answered](#)
[120 Answered](#)
[121 Answered](#)
[122 Current Question](#)
[123 ...](#)
[124 ...](#)
[125 ...](#)
[126 ...](#)
[127 ...](#)
[128 ...](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 122 of 142



A 64 year old man presents to ED with progressive hearing loss in his left ear, together with drooping of his left lip and complaints of food collecting in his left oral vestibule. Imaging shows a tumour compressing which of the following structures:

- a) Hypoglossal canal
- b) Internal auditory meatus
- c) Foramen ovale
- d) Foramen rotundum
- e) Jugular foramen

Answer

The vestibular nerve and facial nerve pass through the internal acoustic meatus, which would account for loss of hearing and weakness of facial muscles respectively.

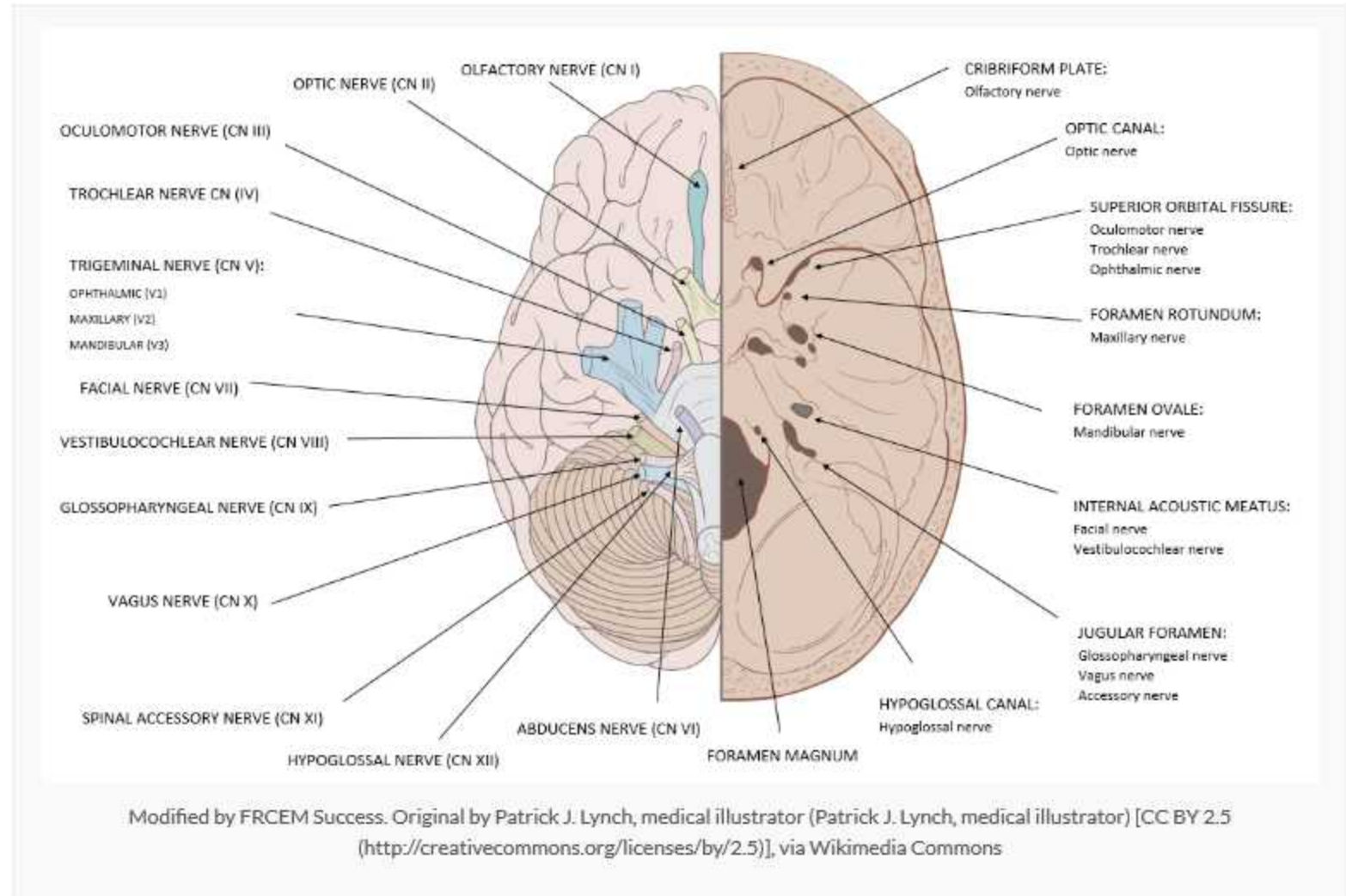
Notes

The vestibulocochlear nerve (CN VIII) is a sensory nerve which transmits sensory information regarding head position and movement via the vestibular nerve, and regarding the reception of sound via the cochlear nerve.

Cranial nerve	Vestibulocochlear nerve (CN VIII)
Key anatomy	Comprised of vestibular and cochlear components which combine in the pons, emerges from the brainstem at the cerebellopontine angle, enters internal acoustic meatus of temporal bone
Function	Sensory: hearing and balance
Assessment	Hearing, Weber and Rinne tests
Clinical effects of injury	Sensorineural deafness, tinnitus, vertigo, loss of equilibrium, nystagmus
Causes of injury	Infection, cerebellopontine angle tumours, basal skull fracture, drugs

Key anatomy

The vestibulocochlear nerve is comprised of two parts. The vestibular and cochlear component combine in the pons to form the vestibulocochlear nerve which emerges from the brainstem at the cerebellopontine angle to enter the internal acoustic meatus of the temporal bone. Within the distal aspect of the internal acoustic meatus, the vestibulocochlear nerve splits, forming the vestibular nerve innervating the vestibular system and the cochlear nerve innervating the cochlear.



Assessment

Hearing should be assessed grossly by whispering numbers and asking the patient to repeat it and by performing Rinne and Weber tests which aim to differentiate between conductive and sensorineural hearing loss. N.B. (AC = air conduction, BC = bone conduction)

Hearing Tests	Weber’s test	Rinne’s test
Screening test	Tests for and distinguishes between conductive and sensorineural deafness in unilateral hearing loss. 512 Hz tuning fork is placed in the middle of the forehead. The patient is asked to report in which ear the sound is heard loudest.	Assesses for the presence of conductive hearing loss in each ear. 512 Hz tuning fork is placed initially on the mastoid process behind each ear until sound is no longer heard (BC), and then placed immediately just outside the ear (AC) with the patient asked to report when the sound is no longer heard.
Normal hearing	Normally sound is heard equally in both ears.	Normally, AC time is longer and louder than BC (AC > BC, Rinne positive).
Unilateral conductive deafness	Sound lateralises to the affected ear.	In the affected ear BC > AC (Rinne negative).
Unilateral sensorineural deafness	Sound lateralises to the normal ear.	In the affected ear AC > BC (Rinne positive).

Clinical implications

Damage to the vestibulocochlear nerve results in (ipsilateral):

- Sensorineural deafness
- Tinnitus
- Loss of equilibrium
- Nystagmus
- Vertigo

Possible causes of damage to the vestibulocochlear nerve include:

- Infections e.g. vestibular neuritis, mastoiditis and herpes zoster
- Cerebellopontine angle tumours (85% are acoustic neuromas, others include meningiomas, cholesteatomas and primary malignancies of the posterior fossa)
- Tumours invading the temporal bone e.g. brainstem glioma
- Vascular malformations at the cerebellopontine angle
- Drugs e.g. aspirin, furosemide, phenytoin, cytotoxics, alcohol
- Paget’s disease
- Fracture of the petrous temporal bone
- Basal skull fracture

Question Navigator

117	Answered
118	Answered
119	Answered
120	Answered
121	Answered
122	Current Question
123	...
124	...
125	...
126	...
127	...
128	...

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 123 of 142

Which of the following is NOT a typical cerebellar sign:

- ☐ a Dysmetria
- ☐ b Ataxia
- ☐ c Resting tremor
- ☐ d Hypotonia
- ☐ e Slurred speech

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)


Question Navigator

117 Answered

118 Answered

119 Answered

120 Answered

121 Answered

122 Answered

123 Current Question

124 ...

125 ...

126 ...

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 123 of 142



Which of the following is NOT a typical cerebellar sign:

- a) Dysmetria
- b) Ataxia
- c) Resting tremor
- d) Hypotonia
- e) Slurred speech

Answer

An intention tremor is characteristic of cerebellar dysfunction. Resting tremor may be seen in Parkinsonism.

Notes

Overview of the brain

The major parts of the developed brain are:

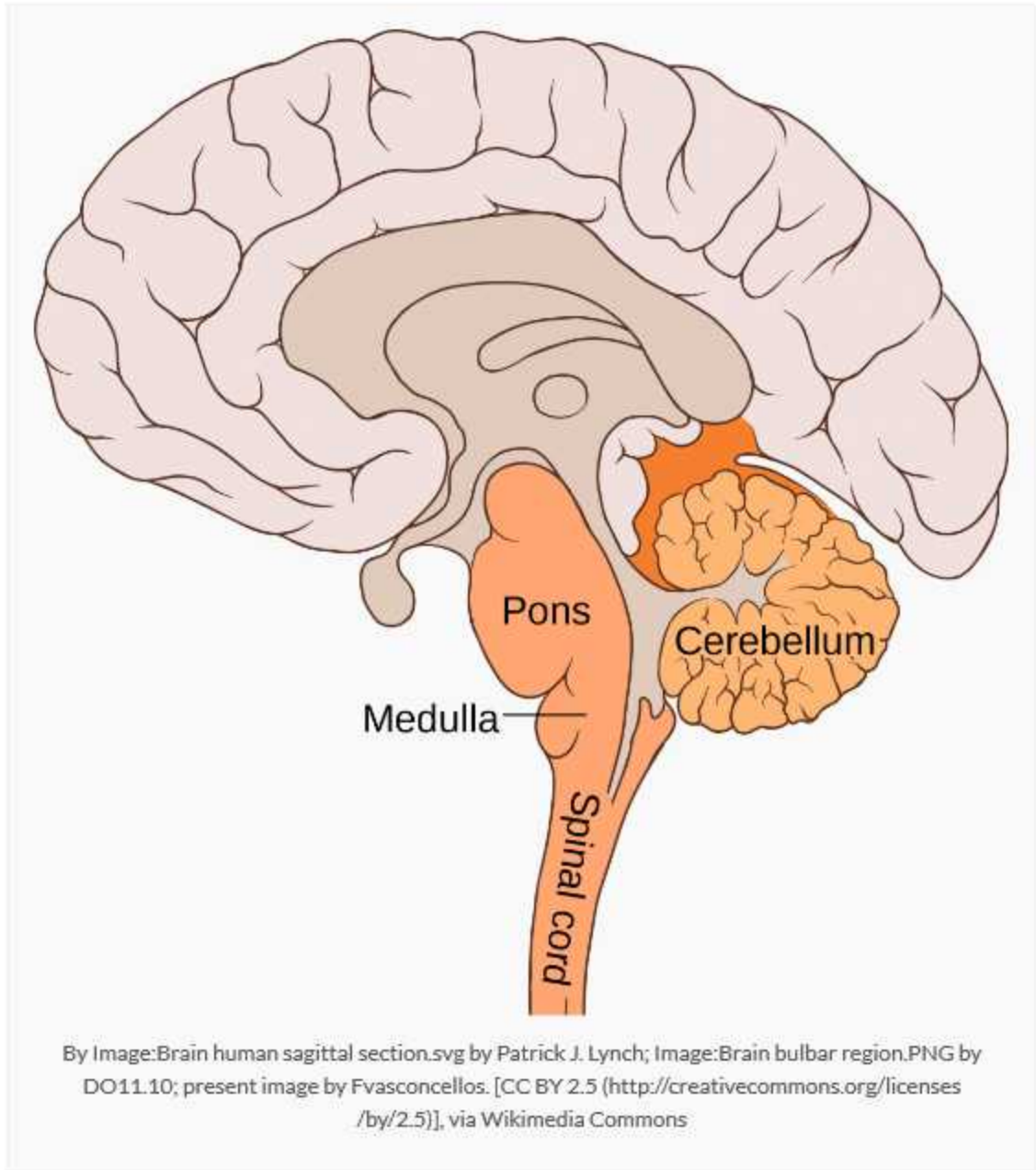
- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebellum

The cerebellum consists of two lateral hemispheres and a midline part, sits infratentorially within the posterior cranial fossa and lies between the temporal and occipital lobes and the brainstem.



By Image:Brain human sagittal section.svg by Patrick J. Lynch; Image:Brain bulbar region.PNG by DO11.10; present image by Fvasconcellos. [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

The cerebellum has three primary functions:

- Maintenance of posture and balance
- Maintenance of muscle tone
- Coordination of voluntary motor activity

Therefore postural reflexes, truncal stability and synergistic muscular movements all depend upon an intact cerebellum. Cerebellar lesions do not cause paralysis but do lead to disturbance of balance and movement.

The cerebellum receives its blood supply from the posterior inferior cerebellar artery, the anterior inferior cerebellar artery and the superior cerebellar artery. Interruption to the blood flow in any of the blood vessels will lead to cerebellar signs.

Cerebellar dysfunction is characterised by DANISH signs:

- Dysmetria (past-pointing) and Dysidiadochokinesia (inability to perform rapid alternating movements)
- Ataxia (lack of coordination of gait, trunk and limbs)
- Nystagmus
- Intention tremor
- Slow/Slurred/Scanning Speech
- Hypotonia

Question Navigator

117	Answered
118	Answered
119	Answered
120	Answered
121	Answered
122	Answered
123	Current Question
124	...
125	...
126	...
127	...
128	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 124 of 142



A 45 year old lady presents to ED with right sided facial weakness. Your consultant suspects a facial nerve palsy. Which of the following clinical features would you most likely see on examination:

- ☐ a Ptosis
- ☐ b Loss of tactile sensation to anterior two-thirds of tongue
- ☐ c Loss of sensation to right side of the face
- ☐ d Hyperacusis
- ☐ e Ophthalmoplegia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

117 Answered

118 Answered

119 Answered

120 Answered

121 Answered

122 Answered

123 Answered

124 Current Question

125 ...

126 ...

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 124 of 142



A 45 year old lady presents to ED with right sided facial weakness. Your consultant suspects a facial nerve palsy. Which of the following clinical features would you most likely see on examination:

- a) Ptosis
- b) Loss of tactile sensation to anterior two-thirds of tongue
- c) Loss of sensation to right side of the face
- d) **Hyperacusis** ✓
- e) Ophthalmoplegia

Answer

Hyperacusis is increased acuity of hearing with hypersensitivity to low tones resulting from paralysis of the stapedius muscle, innervated by the facial nerve. General sensation to the face and to the anterior two-thirds of the tongue is carried by the divisions of the trigeminal nerve (although taste to the anterior two-thirds of the tongue is supplied by the facial nerve). Eye movements are mediated by the oculomotor, trochlear and abducens nerve. Ptosis results from paralysis of the levator palpebrae superioris, innervated by the oculomotor nerve, or the superior tarsal muscle, innervated by the sympathetic chain.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

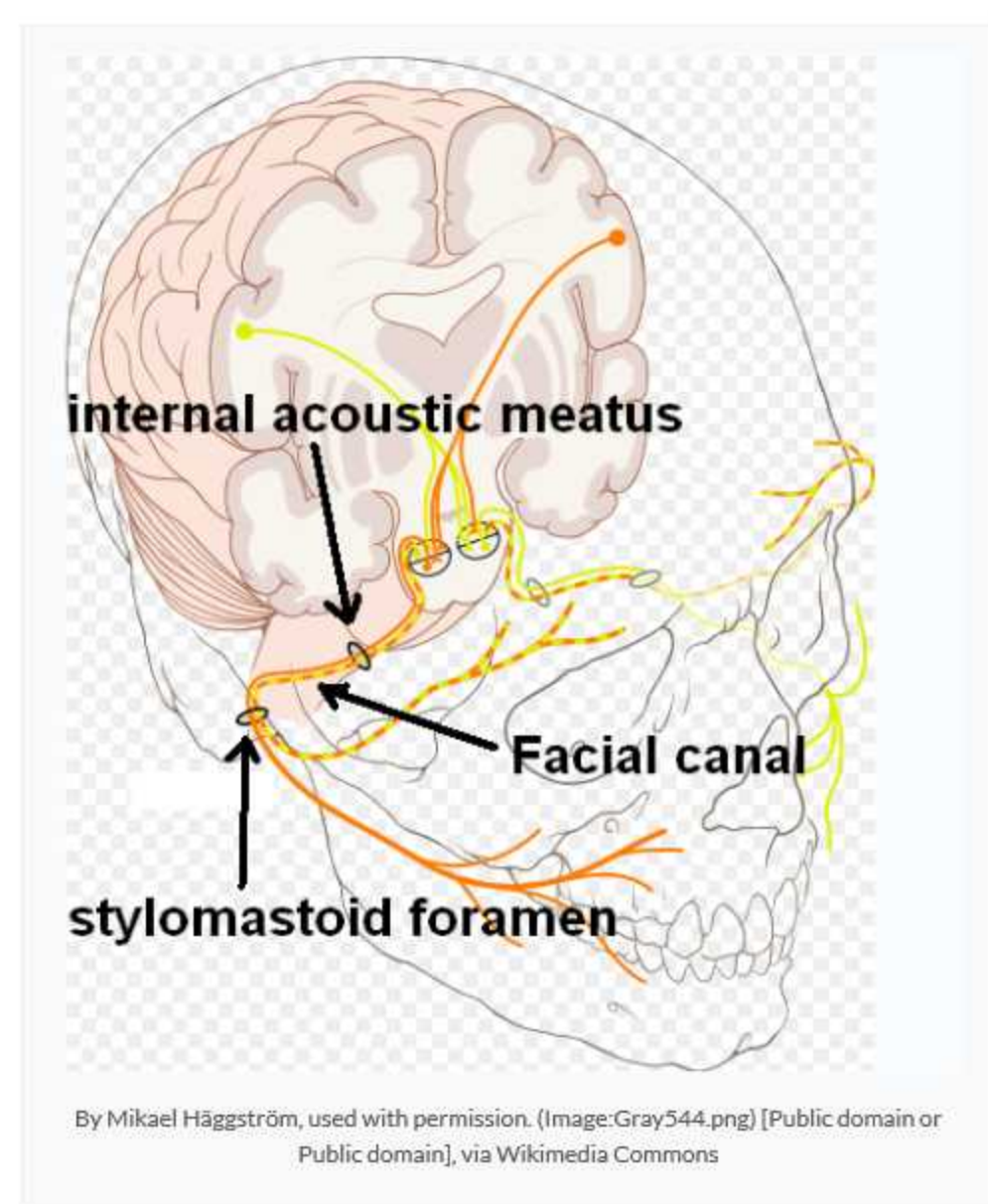
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

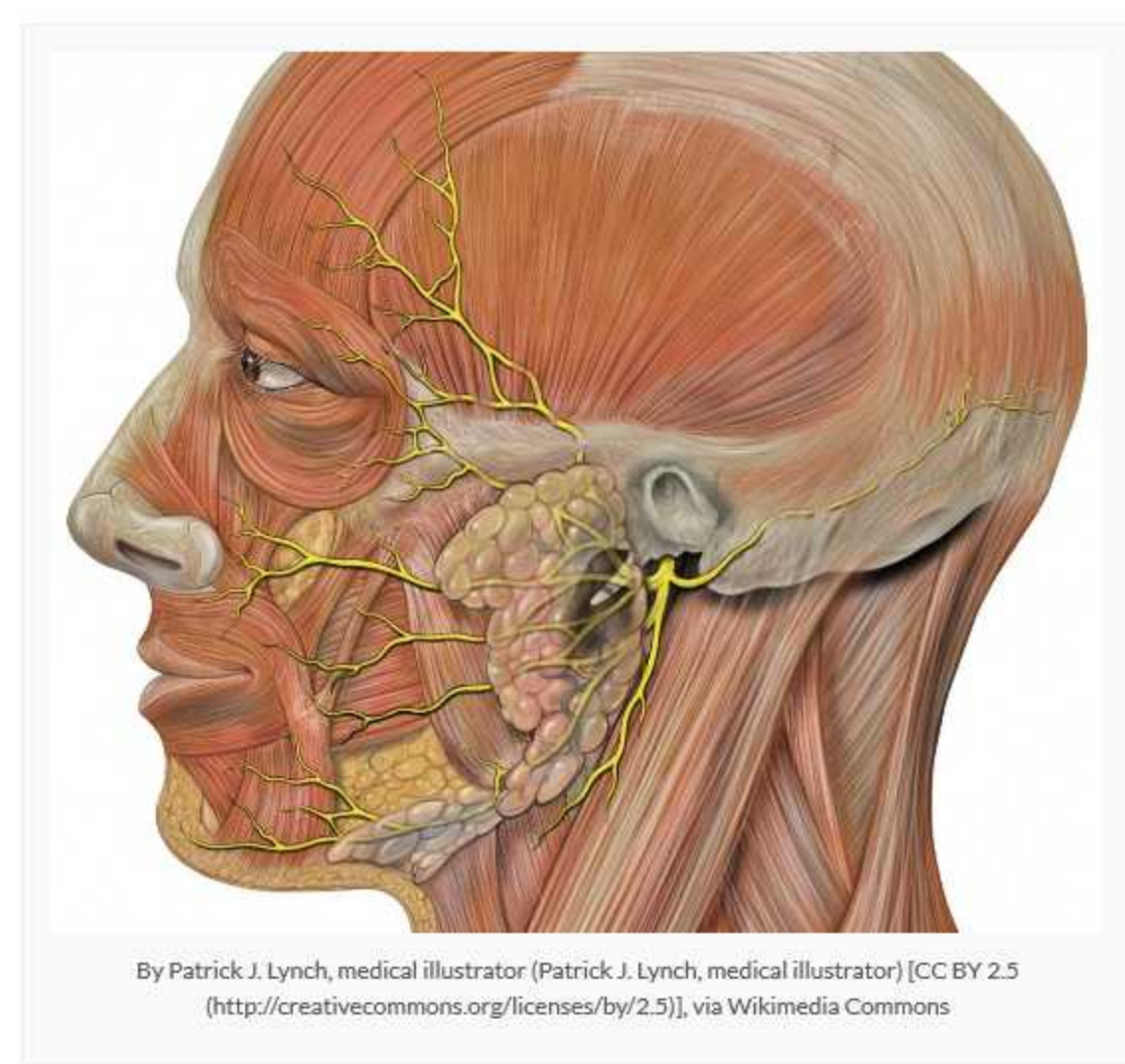
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and dropping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[< Previous](#)
[Next >](#)
[Something wrong?](#)

Question Navigator

117	Answered
118	Answered
119	Answered
120	Answered
121	Answered
122	Answered
123	Answered
124	Current Question
125	...
126	...
127	...
128	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 125 of 142



The primary motor cortex is located in which of the following regions:

- ☐ a Occipital lobe
- ☐ b Parietal lobe
- ☐ c Frontal lobe
- ☐ d Temporal lobe
- ☐ e Brainstem

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

117 Answered

118 Answered

119 Answered

120 Answered

121 Answered

122 Answered

123 Answered

124 Answered

125 Current Question

126 ...

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 125 of 142

The primary motor cortex is located in which of the following regions:

- a) Occipital lobe
- b) Parietal lobe
- c) Frontal lobe
- d) Temporal lobe
- e) Brainstem

Answer

The primary motor cortex is located in the precentral gyrus of the frontal lobe and is responsible for voluntary movements of muscles of the opposite side of the body.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

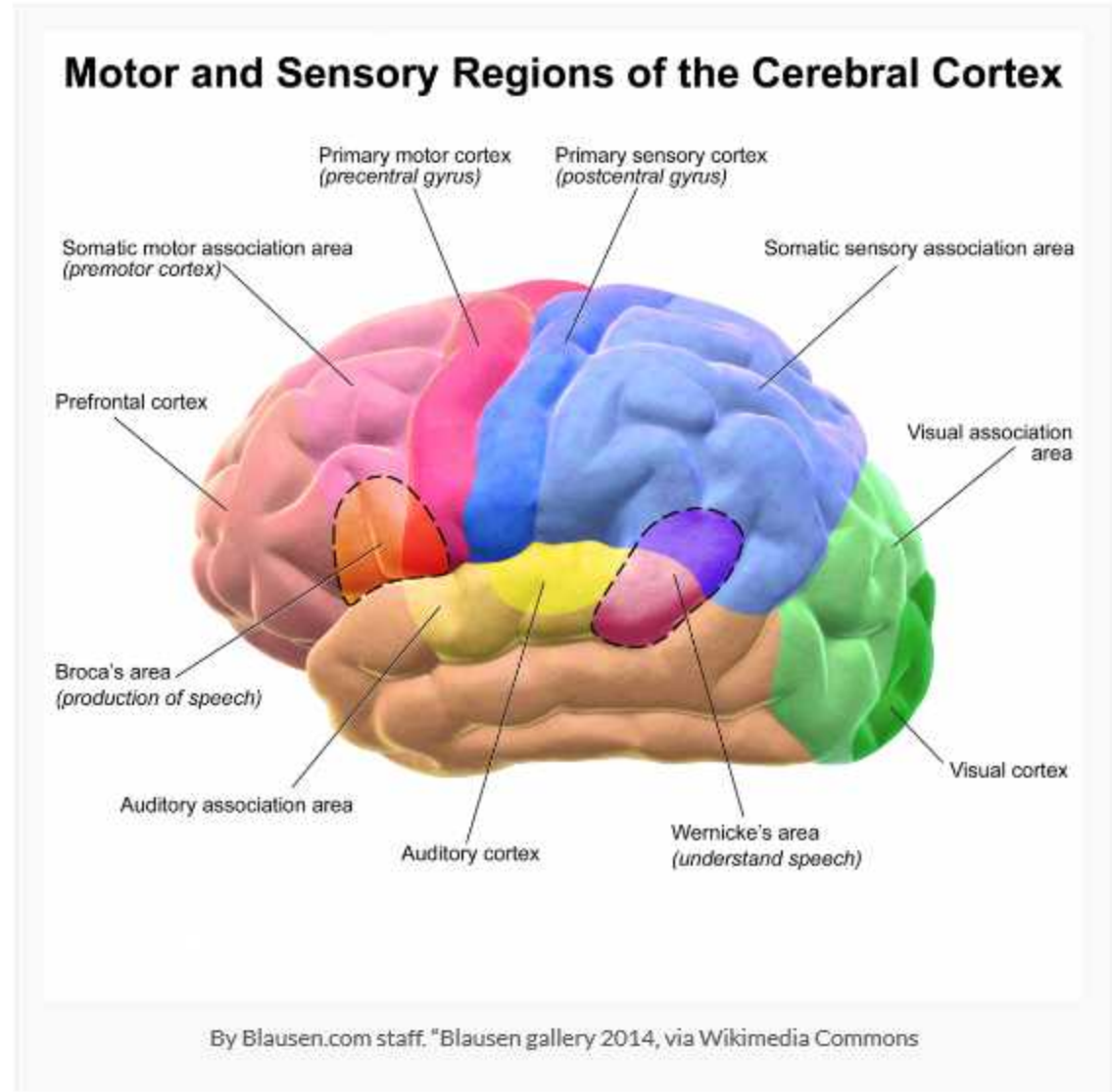
Areas of the frontal lobe are responsible for:

- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

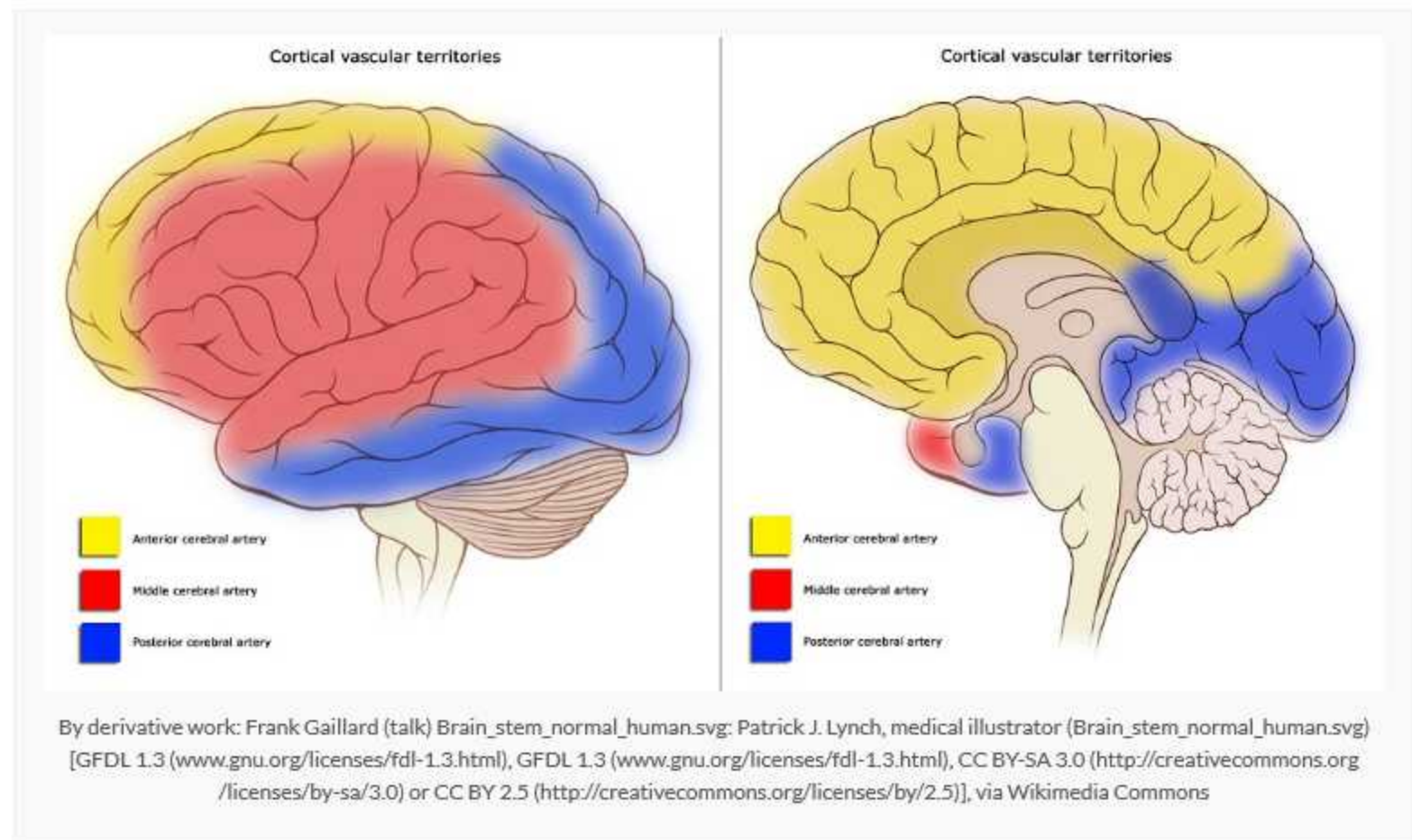
Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.



Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

Question Navigator

117	Answered
118	Answered
119	Answered
120	Answered
121	Answered
122	Answered
123	Answered
124	Answered
125	Current Question
126	...
127	...
128	...

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 126 of 142

Which of the following nerves is the afferent pathway of the gag reflex:

- ☐ a Vagus nerve
- ☐ b Glossopharyngeal nerve
- ☐ c Trigeminal nerve
- ☐ d Hypoglossal nerve
- ☐ e Facial nerve

< Previous

Next >

See Answer

Something wrong?



Question Navigator

117 Answered

118 Answered

119 Answered

120 Answered

121 Answered

122 Answered

123 Answered

124 Answered

125 Answered

126 Current Question

127 ...

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 126 of 142

Which of the following nerves is the afferent pathway of the gag reflex:

- a) Vagus nerve
- b) Glossopharyngeal nerve
- c) Trigeminal nerve
- d) Hypoglossal nerve
- e) Facial nerve

Answer

The glossopharyngeal nerve is the afferent pathway of the gag reflex. The vagus nerve is the efferent pathway of the gag reflex.

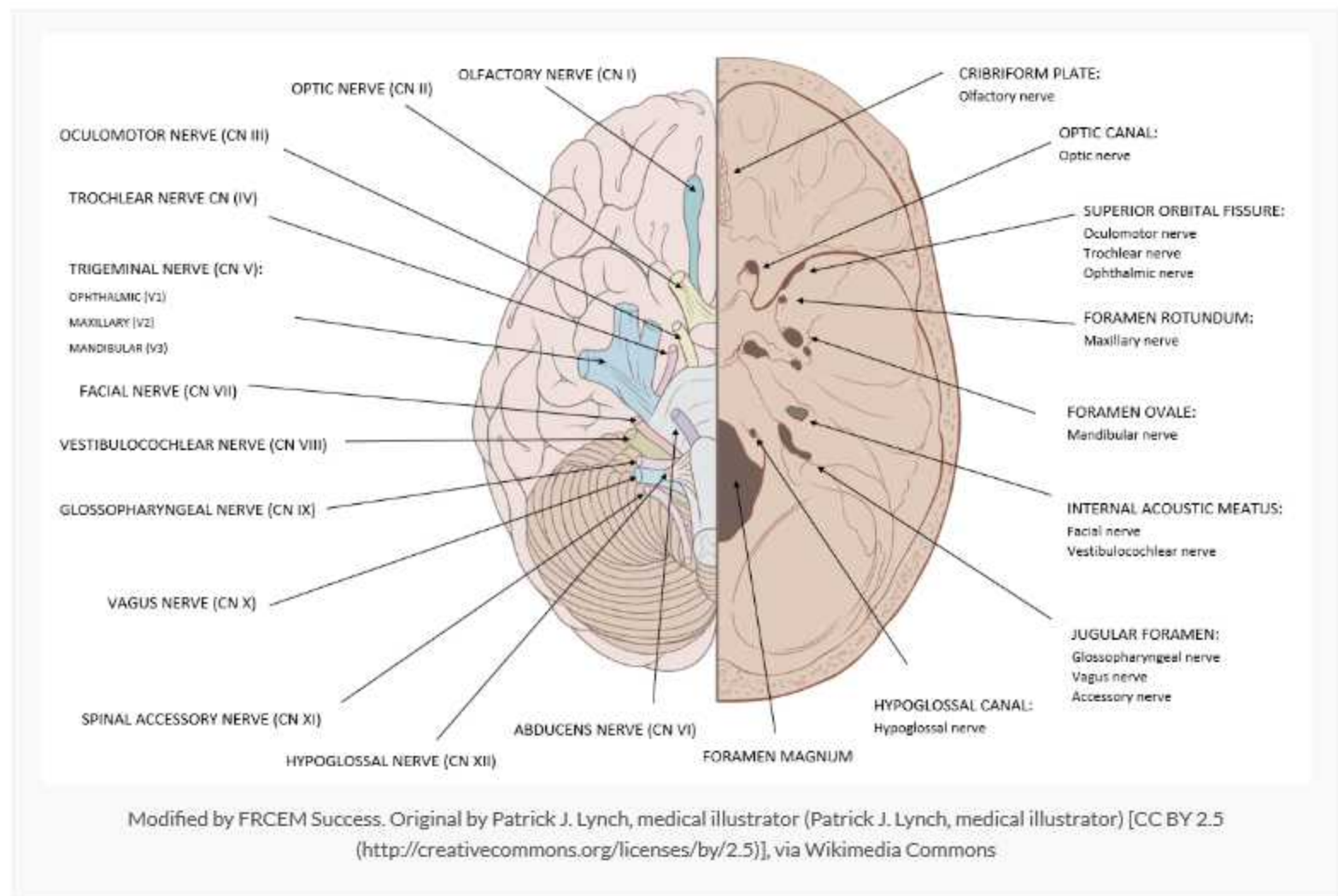
Notes

The glossopharyngeal nerve (CN IX) mediates taste, salivation and swallowing (together with CN X).

Cranial nerve	Glossopharyngeal nerve (CN IX)
Key anatomy	Originates from medulla, exits skull via jugular foramen
Sensory function	Posterior one-third of tongue, tonsils, oropharynx, soft palate, middle ear, taste from posterior one-third of tongue, visceral afferents from carotid body and sinus, afferent pathway of gag reflex
Motor function	Stylopharyngeus muscle (facilitates swallowing), parasympathetic fibres to parotid gland
Assessment	Gag reflex, swallowing
Clinical effects of injury	Loss of gag reflex, dysphagia, loss of carotid sinus reflex, loss of taste from posterior one-third of tongue
Causes of injury	Occipital condyle fractures, lateral medullary syndrome, jugular foramen syndrome, carotid artery dissection

Key anatomy

The glossopharyngeal nerve originates from the medulla and travels lateral in the posterior cranial fossa before emerging from the cranial cavity via the jugular foramen.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Function

The glossopharyngeal nerve carries:

- General visceral afferent fibres from the carotid body and sinus
- General sensory afferent fibres from the posterior one-third of the tongue, palatine tonsils, oropharynx, soft palate, and mucosa of the middle ear, pharyngotympanic tube and mastoid ear cells
- Special afferent fibres for taste from the posterior one-third of the tongue
- Parasympathetic secretomotor fibres to the parotid salivary gland
- Motor fibres to the stylopharyngeus muscle (elevates larynx and pharynx facilitating swallowing)

Clinical implications

CN IX palsy will result in:

- Loss of gag reflex (afferent pathway)
- Loss of carotid sinus reflex
- Loss of taste from posterior one-third of tongue
- Dysphagia

Isolated glossopharyngeal nerve palsy is rare. It is usually damaged with CN X and XI, close to the jugular foramen.

Causes of damage to CN IX include:

- Occipital condyle fractures
- Lateral medullary syndrome
- Ischaemia secondary to vertebral artery damage
- Jugular foramen syndrome (palsy of CN IX, X, XI and XII caused by tumours, meningitis and infection from the middle ear spreading into the posterior fossa or trauma)
- Carotid artery dissection

Question Navigator

117	Answered
118	Answered
119	Answered
120	Answered
121	Answered
122	Answered
123	Answered
124	Answered
125	Answered
126	Current Question
127	...
128	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 127 of 142



Which of the following clinical features is most suggestive of a lesion of the frontal lobe:

- ☐ a Homonymous hemianopia
- ☐ b Hemispatial neglect
- ☐ c Receptive dysphasia
- ☐ d Auditory agnosia
- ☐ e Conjugate eye deviation towards the side of the lesion

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

117 Answered

118 Answered

119 Answered

120 Answered

121 Answered

122 Answered

123 Answered

124 Answered

125 Answered

126 Answered

127 Current Question

128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 127 of 142



Which of the following clinical features is most suggestive of a lesion of the frontal lobe:

- a) Homonymous hemianopia
- b) Hemispatial neglect
- c) Receptive dysphasia
- d) Auditory agnosia
- e) Conjugate eye deviation towards the side of the lesion

Answer

Conjugate eye deviation towards the side of the lesion is seen in damage to the frontal eye field of the frontal lobe. Homonymous hemianopia is typically a result of damage to the occipital lobe (or of the optic radiation passing through the parietal and temporal lobes). Auditory agnosia may be seen in a lesion of the temporal lobe. Hemispatial neglect may be seen in a lesion of the parietal lobe. Receptive dysphasia is seen in damage to Wernicke's area, in the temporal lobe.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

Areas of the frontal lobe are responsible for:

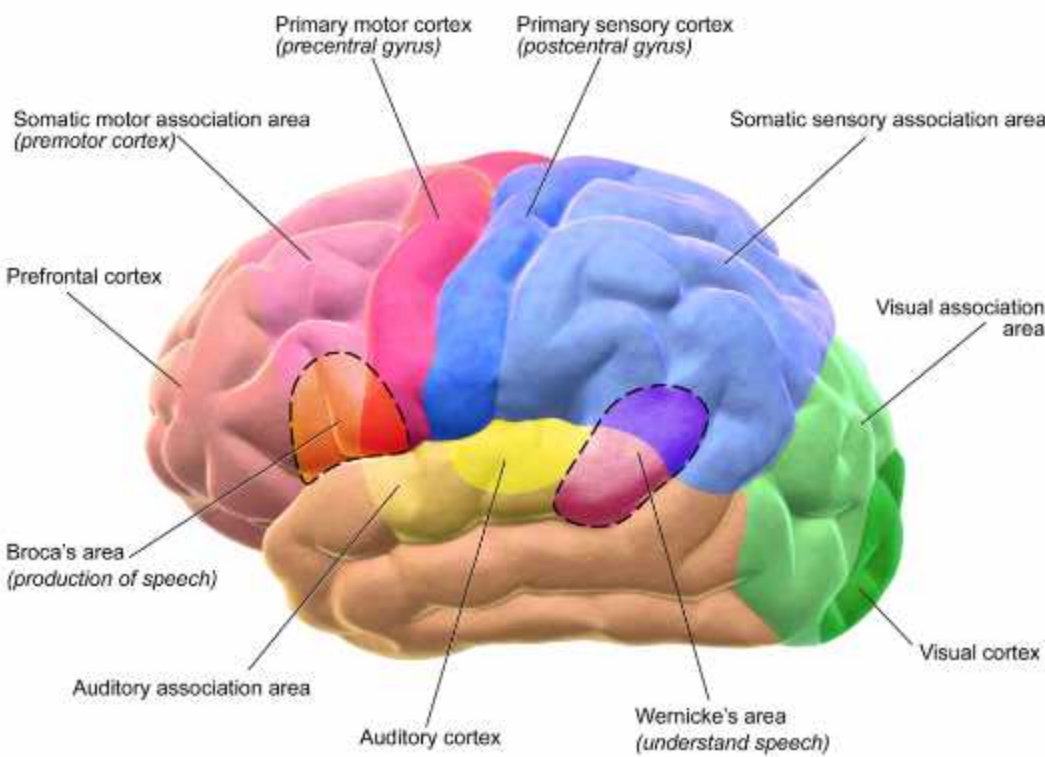
- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.

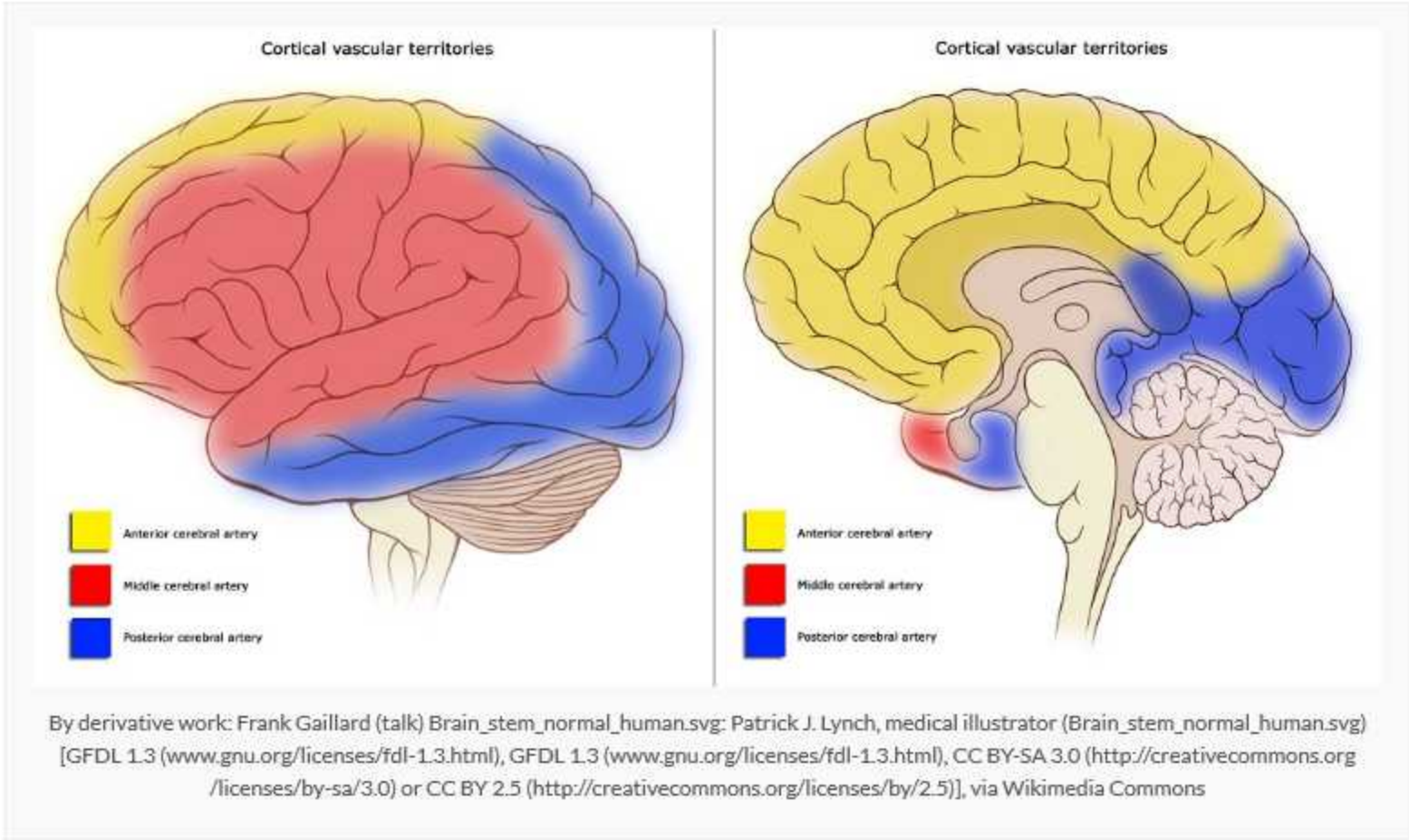
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

< Previous

Next >

Something wrong?

Question Navigator

- 117 Answered
- 118 Answered
- 119 Answered
- 120 Answered
- 121 Answered
- 122 Answered
- 123 Answered
- 124 Answered
- 125 Answered
- 126 Answered
- 127 Current Question
- 128 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get In Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 128 of 142



The hypoglossal nerve innervates all of the following muscles EXCEPT for the:

- ☐ a Genioglossus
- ☐ b Intrinsic muscles of the tongue
- ☐ c Hyoglossus
- ☐ d Styloglossus
- ☐ e Palatoglossus

< Previous

Next >

See Answer

Something wrong?

Question Navigator

- 117 Answered
- 118 Answered
- 119 Answered
- 120 Answered
- 121 Answered
- 122 Answered
- 123 Answered
- 124 Answered
- 125 Answered
- 126 Answered
- 127 Answered
- 128 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 128 of 142

The hypoglossal nerve innervates all of the following muscles EXCEPT for the:

- a) Genioglossus
- b) Intrinsic muscles of the tongue
- c) Hyoglossus
- d) Styloglossus
- e) Palatoglossus

Answer

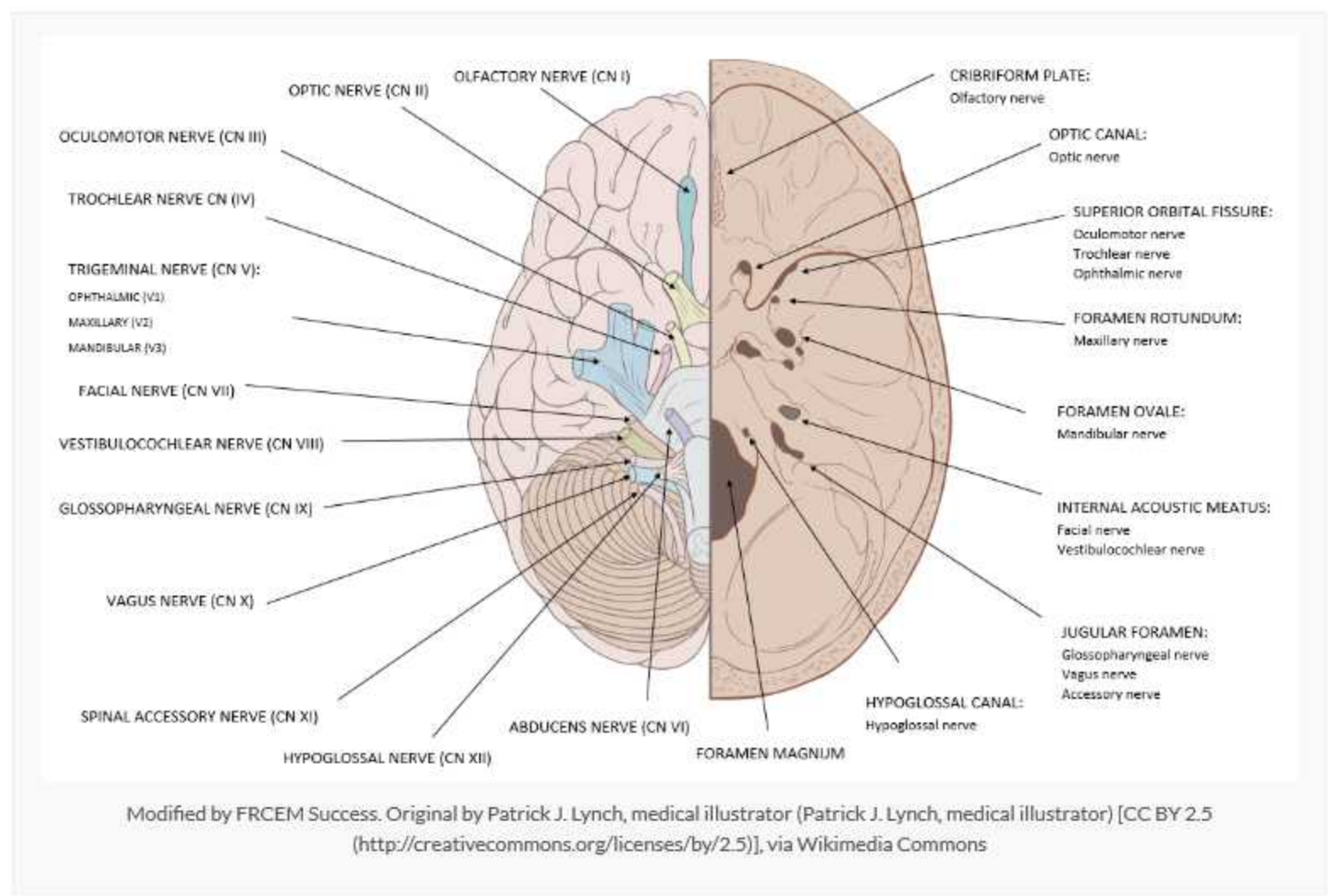
The hypoglossal nerve innervates all of the muscles of the tongue, except for the palatoglossus muscle innervated by the vagus nerve.

Notes

Cranial nerve	Hypoglossal nerve (CN XII)
Key anatomy	Arises from medulla, exits skull through hypoglossal canal
Function	Motor: all intrinsic and extrinsic muscles of tongue (except for palatoglossus)
Assessment	Power and symmetry of tongue, tongue protrusion to look for deviation
Clinical effects of injury	Hemiparalysis of tongue with wasting and fasciculations, tongue deviation towards weak side
Causes of injury	Penetrating trauma, tumours, meningitis, extension of middle ear infection

Key anatomy

The hypoglossal nerve (CN XII) arises from the medulla and passes laterally across the posterior cranial fossa within the subarachnoid space before emerging from the cranial cavity via the hypoglossal canal. It then passes inferiorly to the angle of the mandible and moves in an anterior direction to enter the tongue.



Function

It innervates the hypoglossus, the genioglossus, the styloglossus and all of the intrinsic muscles of the tongue (i.e. all the muscles of the tongue except for the extrinsic palatoglossus muscle innervated by the vagus nerve).

Assessment

The hypoglossal nerve is assessed by asking the patient to protrude their tongue to look for deviation and testing power of the tongue by asking the patient to push their tongue against their cheek.

Clinical implications

In CN XII palsy there is hemiparalysis of the tongue associated with muscle wasting and fasciculations. The tongue deviates towards the weak side upon protrusion due to the unopposed action of the opposite genioglossus.

Isolated hypoglossal nerve injury is relatively uncommon. Possible causes include penetrating traumatic injuries, tumours (e.g. metastases, neurofibroma, cerebellopontine angle lesions), meningitis and infection from the middle ear spreading into the posterior fossa.

Question Navigator

- 117 Answered
- 118 Answered
- 119 Answered
- 120 Answered
- 121 Answered
- 122 Answered
- 123 Answered
- 124 Answered
- 125 Answered
- 126 Answered
- 127 Answered
- 128 Current Question

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 129 of 142



Regarding the hypoglossal nerve, which of the following statements is CORRECT:

- ☐ a The hypoglossal nerve emerges from the cranial cavity via the jugular foramen.
- ☐ b The hypoglossal nerve innervates all of the muscles of the tongue.
- ☐ c In hypoglossal nerve palsy, the tongue deviates away from the affected side on protrusion.
- ☐ d Hypoglossal nerve palsy results in weakness of the ipsilateral tongue.
- ☐ e Hypoglossal nerve palsy results in loss of the gag reflex.

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

127 [Current Question](#)

130 ...

131 ...

132 ...

133 ...

134 ...

135 ...

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 129 of 142



Regarding the hypoglossal nerve, which of the following statements is CORRECT:

- a) The hypoglossal nerve emerges from the cranial cavity via the jugular foramen.
- b) The hypoglossal nerve innervates all of the muscles of the tongue. ❌
- c) In hypoglossal nerve palsy, the tongue deviates away from the affected side on protrusion.
- d) Hypoglossal nerve palsy results in weakness of the ipsilateral tongue. ✅
- e) Hypoglossal nerve palsy results in loss of the gag reflex.

Answer

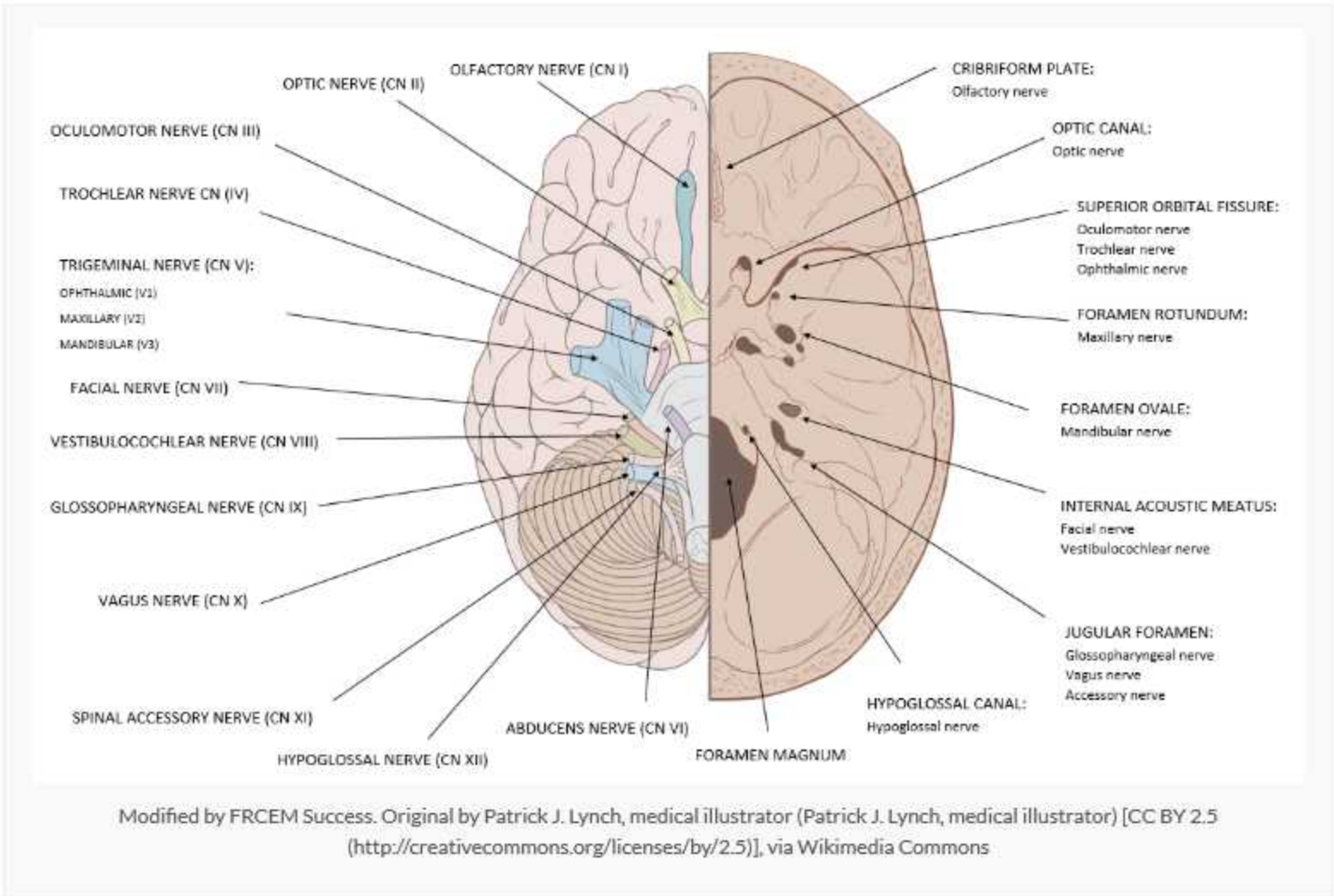
The hypoglossal nerve exits the cranial cavity through the hypoglossal canal and innervates all of the muscles of the tongue, except for the palatoglossus muscle innervated by the vagus nerve. In palsy, when protruded, the tongue will deviate towards the affected side, and is associated with weakness, wasting and fasciculations of the ipsilateral tongue. The hypoglossal nerve is not involved in the gag reflex.

Notes

Cranial nerve	Hypoglossal nerve (CN XII)
Key anatomy	Arises from medulla, exits skull through hypoglossal canal
Function	Motor: all intrinsic and extrinsic muscles of tongue (except for palatoglossus)
Assessment	Power and symmetry of tongue, tongue protrusion to look for deviation
Clinical effects of injury	Hemiparalysis of tongue with wasting and fasciculations, tongue deviation towards weak side
Causes of injury	Penetrating trauma, tumours, meningitis, extension of middle ear infection

Key anatomy

The hypoglossal nerve (CN XII) arises from the medulla and passes laterally across the posterior cranial fossa within the subarachnoid space before emerging from the cranial cavity via the hypoglossal canal. It then passes inferiorly to the angle of the mandible and moves in an anterior direction to enter the tongue.



Modified by FRCEM Success. Original by Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (<http://creativecommons.org/licenses/by/2.5>)], via Wikimedia Commons

Function

It innervates the hypoglossus, the genioglossus, the styloglossus and all of the intrinsic muscles of the tongue (i.e. all the muscles of the tongue except for the extrinsic palatoglossus muscle innervated by the vagus nerve).

Assessment

The hypoglossal nerve is assessed by asking the patient to protrude their tongue to look for deviation and testing power of the tongue by asking the patient to push their tongue against their cheek.

Clinical implications

In CN XII palsy there is hemiparalysis of the tongue associated with muscle wasting and fasciculations. The tongue deviates towards the weak side upon protrusion due to the unopposed action of the opposite genioglossus.

Isolated hypoglossal nerve injury is relatively uncommon. Possible causes include penetrating traumatic injuries, tumours (e.g. metastases, neurofibroma, cerebellopontine angle lesions), meningitis and infection from the middle ear spreading into the posterior fossa.

Question Navigator

129	Current question
130	...
131	...
132	...
133	...
134	...
135	...
136	...
137	...
138	...
139	...
140	...
141	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 130 of 142



A 64 year old lady complains of a sore right eye. On examination, you note a normal corneal blink reflex on her left side but no consensual blink reflex on her right side. A lesion in which of the following structures is most likely to cause this clinical picture:

- ☐ a Ophthalmic nerve
- ☐ b Oculomotor nerve
- ☐ c Optic nerve
- ☐ d Facial nerve
- ☐ e Trigeminal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

130 Current Question

131 ...

132 ...

133 ...

134 ...

135 ...

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 130 of 142



A 64 year old lady complains of a sore right eye. On examination, you note a normal corneal blink reflex on her left side but no consensual blink reflex on her right side. A lesion in which of the following structures is most likely to cause this clinical picture:

- a) Ophthalmic nerve
- b) Oculomotor nerve
- c) Optic nerve
- d) **Facial nerve** ✓
- e) Trigeminal nerve

Answer

The corneal blink reflex is an involuntary blinking of the eyelids, mediated by the orbicularis oculi muscle, and elicited by stimulation of the cornea. The afferent pathway is the ophthalmic division of the trigeminal nerve, and the efferent pathway is the facial nerve. Loss of the consensual corneal blink reflex suggests loss of the efferent pathway on this side.

Notes

The facial nerve (CN VII) mediates facial movements, taste, salivation and lacrimation.

Cranial nerve	Facial nerve (CN VII)
Key anatomy	Exits brainstem in cerebellopontine angle, enters internal auditory meatus and facial canal, exits facial canal and skull via stylomastoid foramen
Motor function	Muscles of facial expression, posterior belly of digastric muscle, stylohyoid muscle, stapedius muscle, parasympathetic innervation to lacrimal, salivary, oral, pharyngeal and nasal glands, efferent pathway of corneal blink reflex
Sensory function	Taste to anterior two-thirds of tongue
Assessment	Facial movements, corneal blink reflex
Clinical effects of injury	Facial weakness, loss of efferent corneal reflex, impaired lacrimal fluid production, hyperacusis, impaired sense of taste to anterior two-thirds of tongue, impaired salivation
Causes of injury	Bell's palsy, Ramsay-Hunt syndrome, Guillain-Barre syndrome, mumps, middle ear disease, tumours, trauma

Function

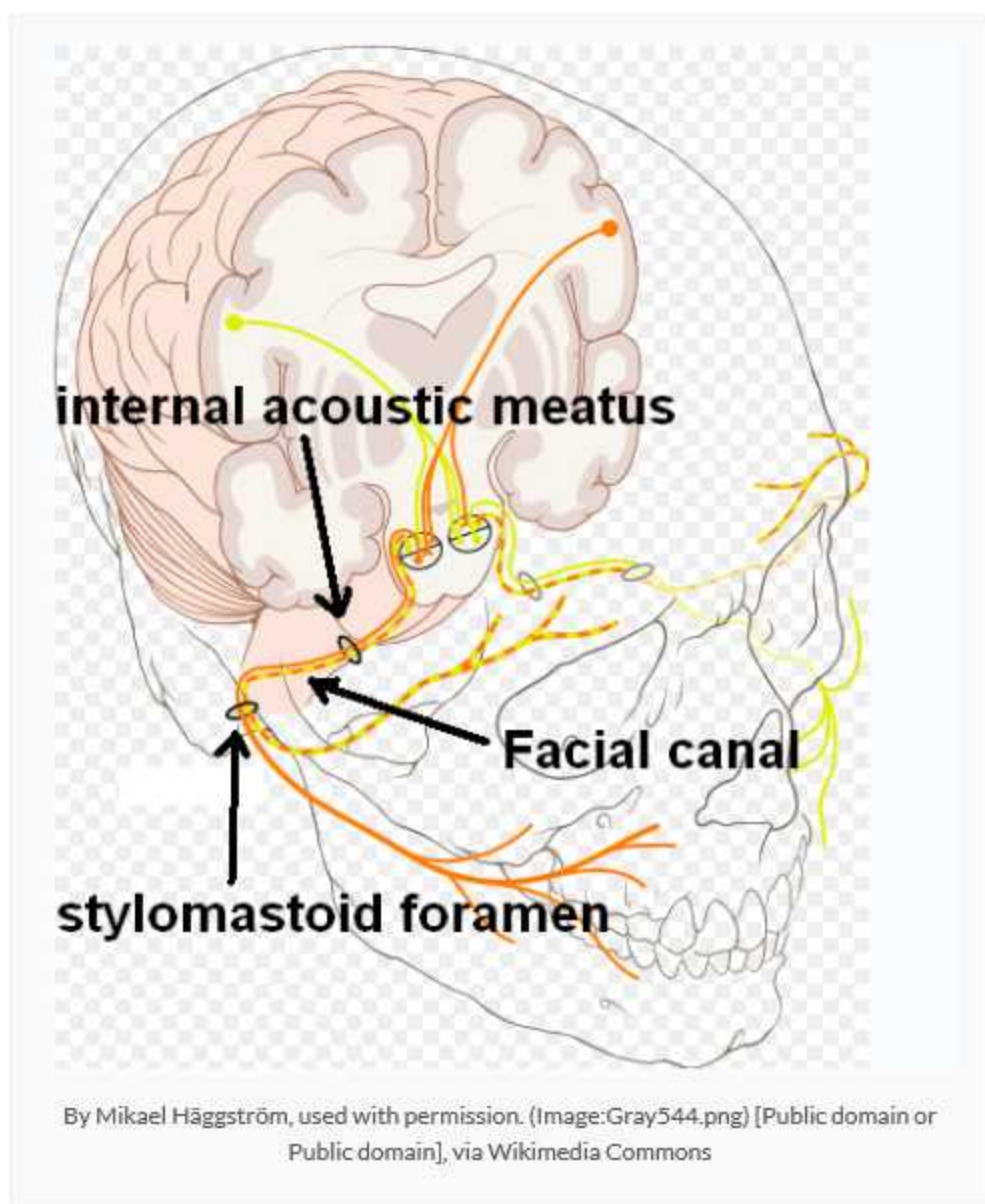
The facial nerve provides motor innervation to the muscles of facial expression, the posterior belly of the digastric, the stylohyoid and the stapedius muscles. The chorda tympani branch supplies taste to the anterior two-thirds of the tongue. The facial nerve also carries parasympathetic innervation to the lacrimal glands, salivary glands, nasal, palatine and pharyngeal mucous glands.

Anatomical course

The facial nerve arises in the pons, leaves the brainstem in the cerebellopontine angle and exits the posterior cranial fossa through the internal acoustic meatus in the temporal bone before entering the facial canal still within the temporal bone where it gives rise to three main branches:

- The nerve to the stapedius (innervating the stapedius muscle)
- The greater petrosal nerve (supplying parasympathetic innervation to the lacrimal gland and the mucous glands of the oral cavity, nose and pharynx)
- The chorda tympani (supplying taste to the anterior two-thirds of the tongue and parasympathetic innervation to all salivary glands below the level of the oral fissure)

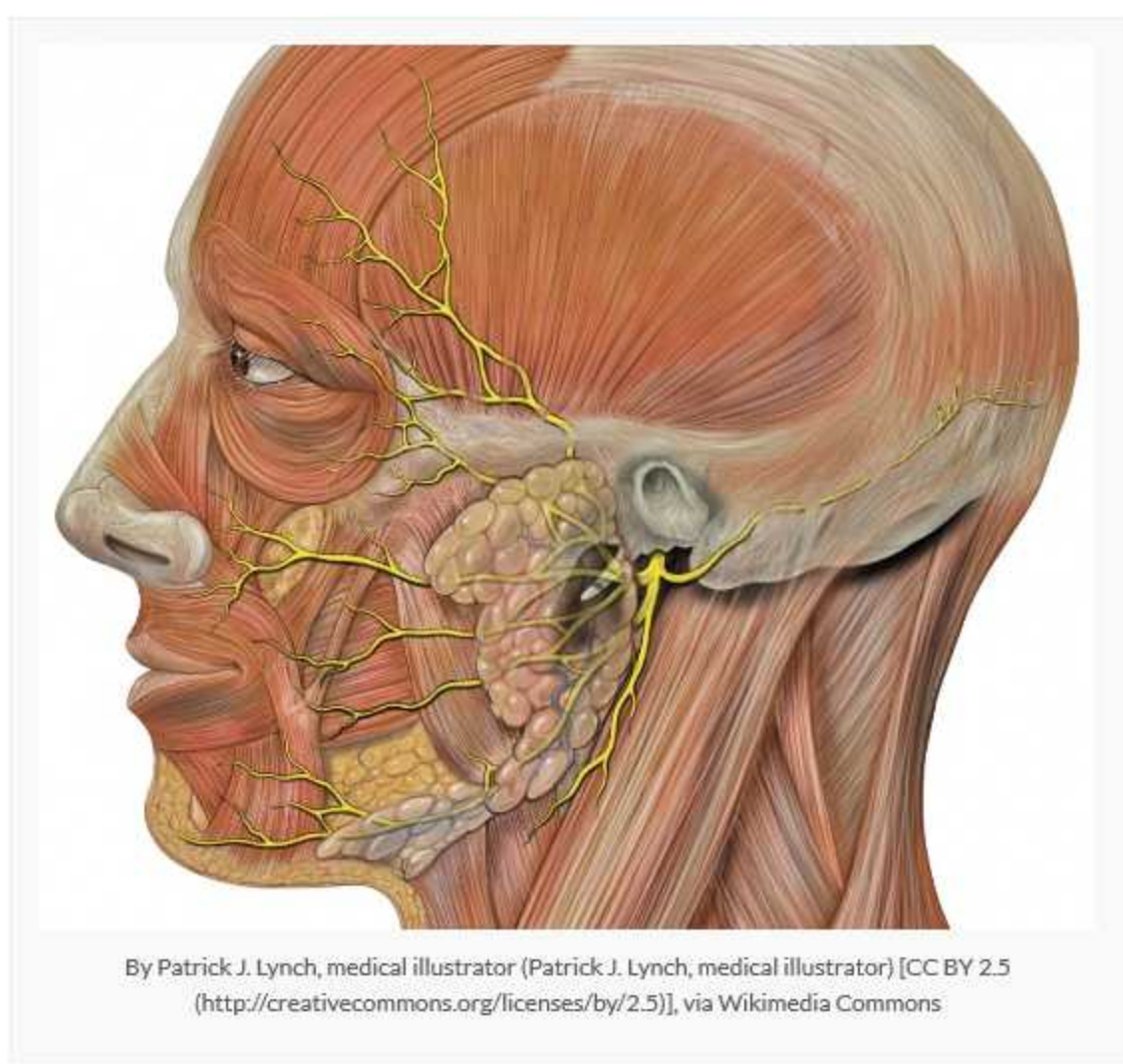
The facial nerve exits the facial canal (and the basal skull) through the stylomastoid foramen between the styloid and mastoid processes of the temporal bone, at which point it gives off the posterior auricular nerve (innervating the occipital belly of the occipitofrontalis muscle of the scalp and external ear muscles).



The facial nerve then gives off motor branches (innervating the posterior belly of the digastric muscle and the stylohyoid muscle) before entering the deep surface of the parotid gland.

Once in the parotid gland, the facial nerve divides into five terminal branches:

- The temporal branch (innervating muscles in the temple, forehead and supraorbital areas)
- The zygomatic branch (innervating muscles in the infraorbital area, the lateral nasal area and the upper lip)
- The buccal branch (innervating muscles in the cheek, the upper lip and the corner of the mouth)
- The marginal mandibular branch (innervating muscles of the lower lip and chin)
- The cervical branch (innervating the platysma muscle)



Clinical implications

Injury to the facial nerve may result in:

- Ipsilateral facial weakness with flattening of the nasolabial fold and dropping of the corners of the mouth, drooping of the lower eyelid and inability to close the eye
- Loss of corneal reflex (due to paralysis of the orbicularis oculi muscle)
- Impaired lacrimal fluid production (due to impaired function of the greater petrosal nerve)
- Hyperacusis (hypersensitivity to sound due to impaired function of the nerve to the stapedius)
- Impaired sense of taste to anterior two-thirds of tongue and impaired salivation (due to impaired function of the chorda tympani)

If the damage is peripheral (LMN), the forehead will be involved and there will be an inability to close the eyes or raise the eyebrows. If the damage is central (UMN) there is forehead sparing as the frontalis and orbicularis oculi muscles are innervated bilaterally.

Causes of CN VII palsy include:

- Bell's palsy (idiopathic)
- Ramsay-Hunt syndrome (herpes zoster infection of the CN VII motor ganglion)
- Guillain-Barre syndrome
- Botulism
- Infection e.g. mumps, measles, chickenpox, otitis externa/media, encephalitis, mastoiditis
- Tumours e.g. parotid tumours, cerebellopontine angle tumours
- Fractures of the petrous temporal bone
- Blunt/penetrating trauma to the face or during parotid surgery
- Penetrating injury to the middle ear or barotrauma
- Brainstem injury

UMN facial nerve palsy warrants CT head to exclude cerebrovascular events and other intracranial causes such as tumours, particularly cerebellopontine angle tumours.

[< Previous](#)
[Next >](#)
[Something wrong?](#)

Question Navigator

130	Current Question
131	...
132	...
133	...
134	...
135	...
136	...
137	...
138	...
139	...
140	...
141	...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get In Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 131 of 142



You are examining a patient who has presented with visual disturbance. Light shone into the right eye elicits a direct but no consensual reflex. A lesion in which of the following structures is most likely responsible for this clinical picture:

- ☐ a Right optic nerve
- ☐ b Left optic nerve
- ☐ c Right oculomotor nerve
- ☐ d Left oculomotor nerve
- ☐ e Right optic radiation

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Current Question

132 ...

133 ...

134 ...

135 ...

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 131 of 142



- You are examining a patient who has presented with visual disturbance. Light shone into the right eye elicits a direct but no consensual reflex. A lesion in which of the following structures is most likely responsible for this clinical picture:
- a) Right optic nerve
 - b) Left optic nerve
 - c) Right oculomotor nerve
 - d) Left oculomotor nerve
 - e) Right optic radiation

Answer

The contralateral oculomotor nerve is responsible for the consensual reflex.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

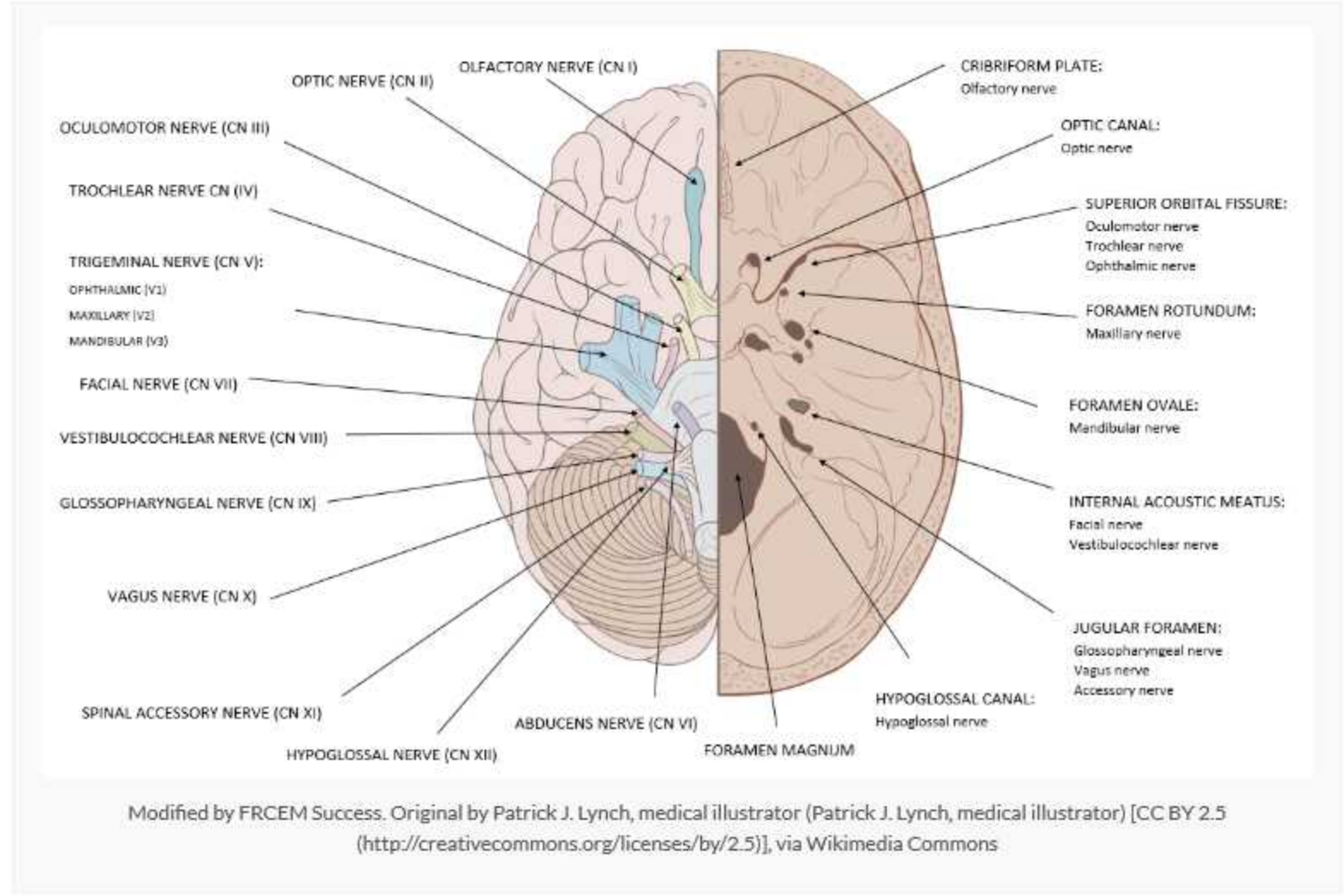
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

131	Current Question
132	...
133	...
134	...
135	...
136	...
137	...
138	...
139	...
140	...
141	...
142	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 132 of 142



The visual cortex is supplied by which of the following blood vessels:

- ☐ a Posterior cerebral artery
- ☐ b Anterior cerebral artery
- ☐ c Middle cerebral artery
- ☐ d Ophthalmic artery
- ☐ e Internal carotid artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Current Question

133 ...

134 ...

135 ...

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 132 of 142

The visual cortex is supplied by which of the following blood vessels:

- a) **Posterior cerebral artery** ✓
- b) Anterior cerebral artery
- c) Middle cerebral artery
- d) Ophthalmic artery
- e) Internal carotid artery

Answer

The visual cortex in the occipital lobe is supplied by the posterior cerebral artery.

Notes

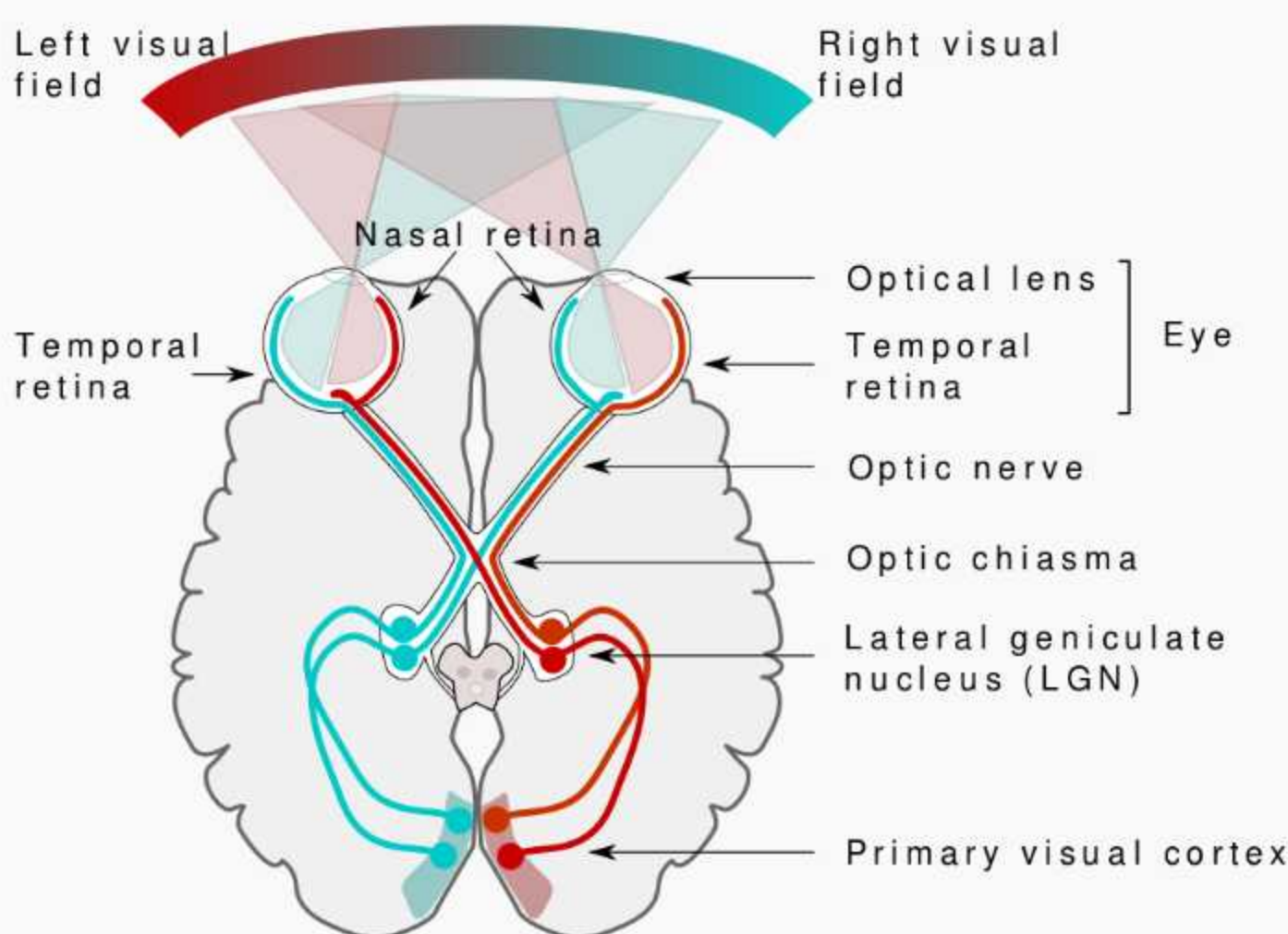
Visual pathway

Rods and cones are the first-order receptor cells that respond directly to light stimulation. Bipolar neurons are the second-order neurons that relay stimuli from the rods and cones to the ganglion cells.

The optic nerve is formed by the convergence of axons from the retinal ganglion cells. The optic nerve leaves the bony orbit via the optic canal, a passageway through the sphenoid bone. It enters the cranial cavity, running along the surface of the middle cranial fossa (in close proximity to the pituitary gland).

Within the middle cranial fossa, the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibres from the medial (nasal) half of each retina cross over, forming the optic tracts. The left optic tract contains fibres from the left lateral (temporal) retina and the right medial retina, and the right optic tract contains fibres from the right lateral retina and the left medial retina. Each optic tract travels to its corresponding cerebral hemisphere to reach its lateral geniculate nucleus (LGN) located in the thalamus where the fibres synapse.

Axons from the LGN then carry visual information via the optic radiation to the visual cortex in the occipital lobe; the upper optic radiation carries fibres from the superior retinal quadrants (corresponding to the inferior visual field quadrants) and travels through the parietal lobe to reach the visual cortex whereas the lower optic radiation carries fibres from the inferior retinal quadrants (corresponding to the superior visual field quadrants) and travels through the temporal lobe to reach the visual cortex of the occipital lobe. At the visual cortex, the brain processes the sensory information and responds appropriately.



By Miquel Perello Nieto (Own work) [CC BY-SA 4.0 (<http://creativecommons.org/licenses/by-sa/4.0/>)], via Wikimedia Commons

Blood supply to visual pathway

Structure	Blood supply
Optic nerve (retinal and orbital part)	Central retinal artery, branch of the ophthalmic artery
Optic nerve (intracranial part) and optic chiasm	Ophthalmic artery, anterior cerebral and anterior communicating arteries
Optic tract	Posterior communicating artery and anterior choroidal artery
Lateral geniculate nucleus	Posterior cerebral artery and anterior choroidal artery
Optic radiations	Middle and posterior cerebral arteries, anterior choroidal artery
Visual cortex	Posterior cerebral artery (macular dually supplied by middle cerebral artery)

Clinical implications

Visual field defects depend upon the site of the lesion:

Site of lesion	Visual defect
Optic nerve	Ipsilateral visual loss
Optic chiasm	Bitemporal hemianopia
Optic tract	Contralateral homonymous hemianopia
Parietal upper optic radiation	Contralateral homonymous inferior quadrantanopia
Temporal lower optic radiation	Contralateral homonymous superior quadrantanopia
Occipital visual cortex	Contralateral homonymous hemianopia with macular sparing

Damage to the optic nerve may be caused by:

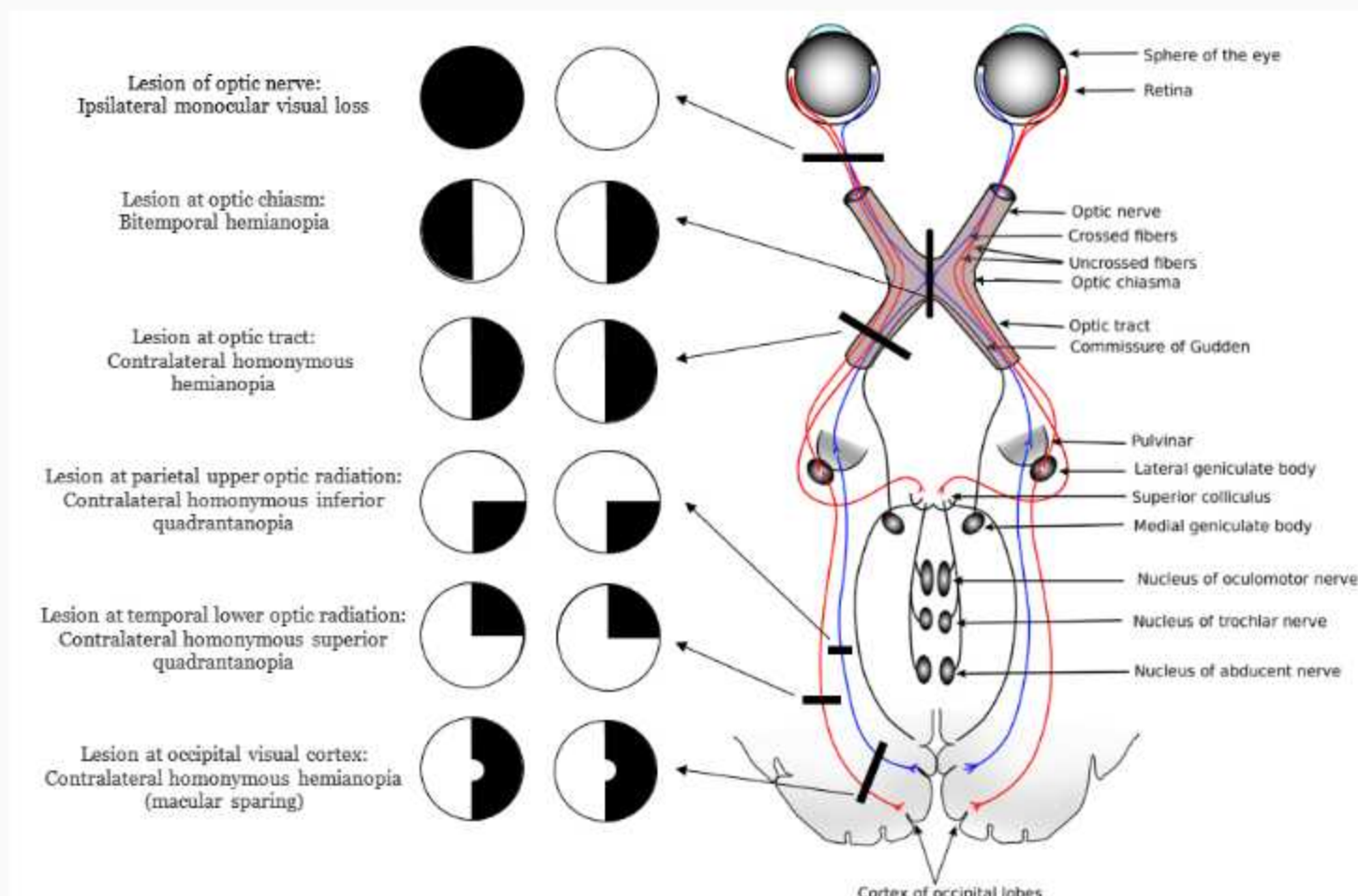
- optic neuritis in multiple sclerosis or secondary to measles or mumps
- optic nerve compression secondary to orbital cellulitis, glaucoma or ocular tumours
- optic nerve toxicity secondary to ethambutol, methanol and ethylene glycol
- optic nerve damage secondary to orbital fracture or penetrating injury to the eye
- optic nerve ischaemia

Compression at the optic chiasm may occur due to:

- pituitary tumour
- craniopharyngioma
- meningioma
- optic glioma
- aneurysm of the internal carotid artery

Damage to the visual tract central to the optic chiasm may be caused by:

- cerebrovascular event
- brain abscess
- brain tumours



By FRCEM Success

< Previous

Next >

Something wrong?

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- LifeintheFastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 133 of 142



A 25 year old woman presents to ED complaining of unsteadiness of her feet and slurred speech. On examination she demonstrates past-pointing, she is unable to perform the heel-shin test and she has nystagmus. The lesion would most likely be in the:

- ☐ a Occipital lobe
- ☐ b Frontal lobe
- ☐ c Cerebellum
- ☐ d Parietal lobe
- ☐ e Temporal lobe

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Current Question

134 ...

135 ...

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



A 25 year old woman presents to ED complaining of unsteadiness of her feet and slurred speech. On examination she demonstrates past-pointing, she is unable to perform the heel-shin test and she has nystagmus. The lesion would most likely be in the:

- a) Occipital lobe
- b) Frontal lobe
- c) **Cerebellum** ✓
- d) Parietal lobe
- e) Temporal lobe

Cerebellar dysfunction is characterised by DANISH signs:

- Dysmetria (past-pointing) and Dysdiadochokinesia (inability to perform rapid alternating movements)
- Ataxia (lack of coordination of gait, trunk and limbs)
- Nystagmus
- Intention tremor
- Slow/Sturred/Scanning Speech
- Hypotonia

Overview of the brain

The major parts of the developed brain are:

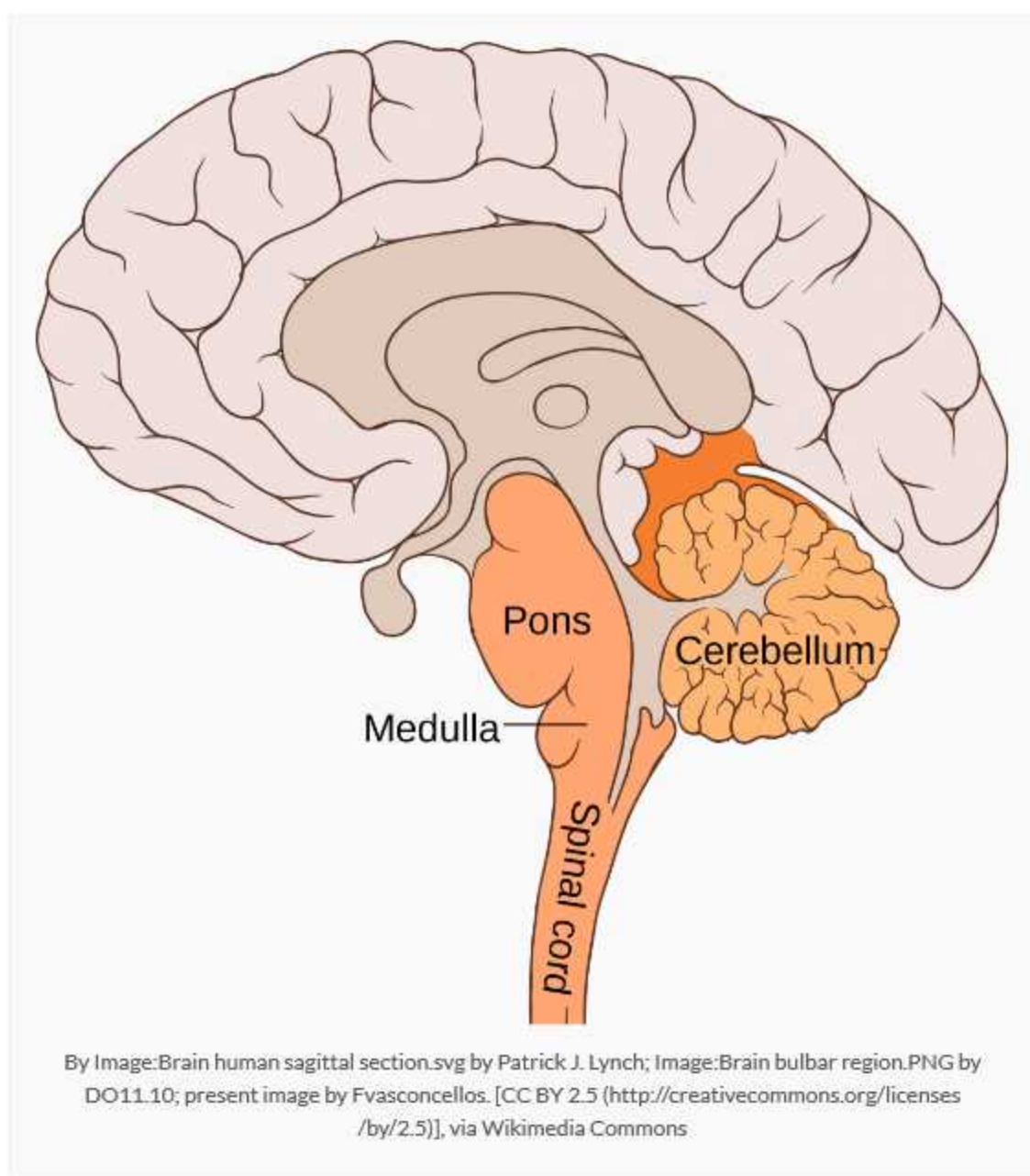
- The cerebrum (cerebral hemispheres and diencephalon)
- The brainstem (midbrain, pons and medulla)
- The cerebellum

Embryologically these structures develop from three primary brain vesicles:

- The forebrain (gives rise to the cerebral hemispheres and basal ganglia and the diencephalon)
- The midbrain (remains as the midbrain)
- The hindbrain (gives rise to the pons, medulla and cerebellum)

Cerebellum

The cerebellum consists of two lateral hemispheres and a midline part, sits infratentorially within the posterior cranial fossa and lies between the temporal and occipital lobes and the brainstem.



The cerebellum has three primary functions:

- Maintenance of posture and balance
- Maintenance of muscle tone
- Coordination of voluntary motor activity

Therefore postural reflexes, truncal stability and synergistic muscular movements all depend upon an intact cerebellum. Cerebellar lesions do not cause paralysis but do lead to disturbance of balance and movement.

The cerebellum receives its blood supply from the posterior inferior cerebellar artery, the anterior inferior cerebellar artery and the superior cerebellar artery. Interruption to the blood flow in any of the blood vessels will lead to cerebellar signs.

Cerebellar dysfunction is characterised by DANISH signs:

- Dysmetria (past-pointing) and Dysdiadochokinesia (inability to perform rapid alternating movements)
- Ataxia (lack of coordination of gait, trunk and limbs)
- Nystagmus
- Intention tremor
- Slow/Slurred/Scanning Speech
- Hypotonia

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 134 of 142



The Broca speech area is located in which of the following regions:

- ☐ a Occipital lobe
- ☐ b Parietal lobe
- ☒ c Frontal lobe
- ☐ d Temporal lobe
- ☐ e Brainstem

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Current Question

135 ...

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

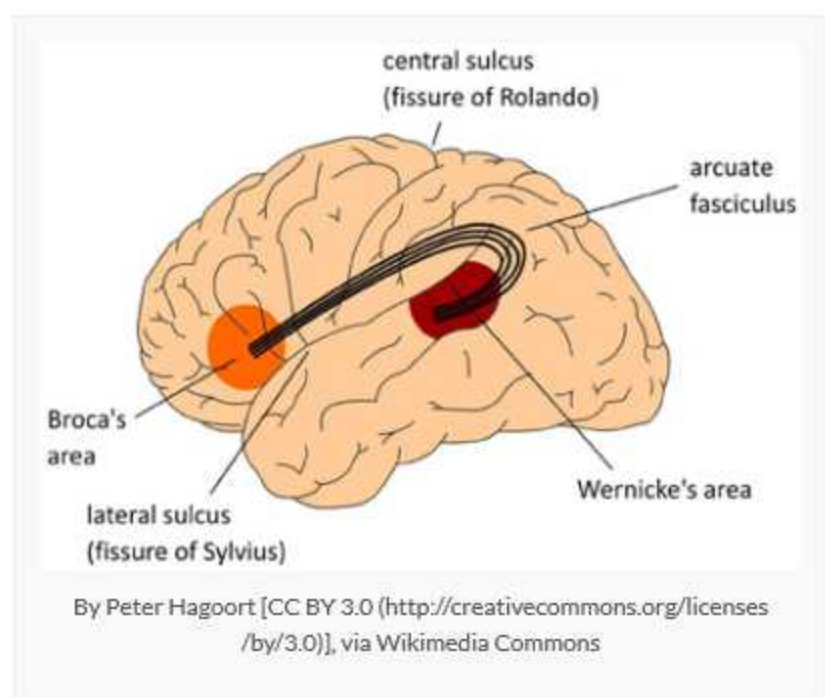
Question 134 of 142

The Broca speech area is located in which of the following regions:

- a) Occipital lobe
- b) Parietal lobe
- c) Frontal lobe
- d) Temporal lobe
- e) Brainstem

Answer

The Broca speech area, in the frontal lobe of the dominant hemisphere, is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.



Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

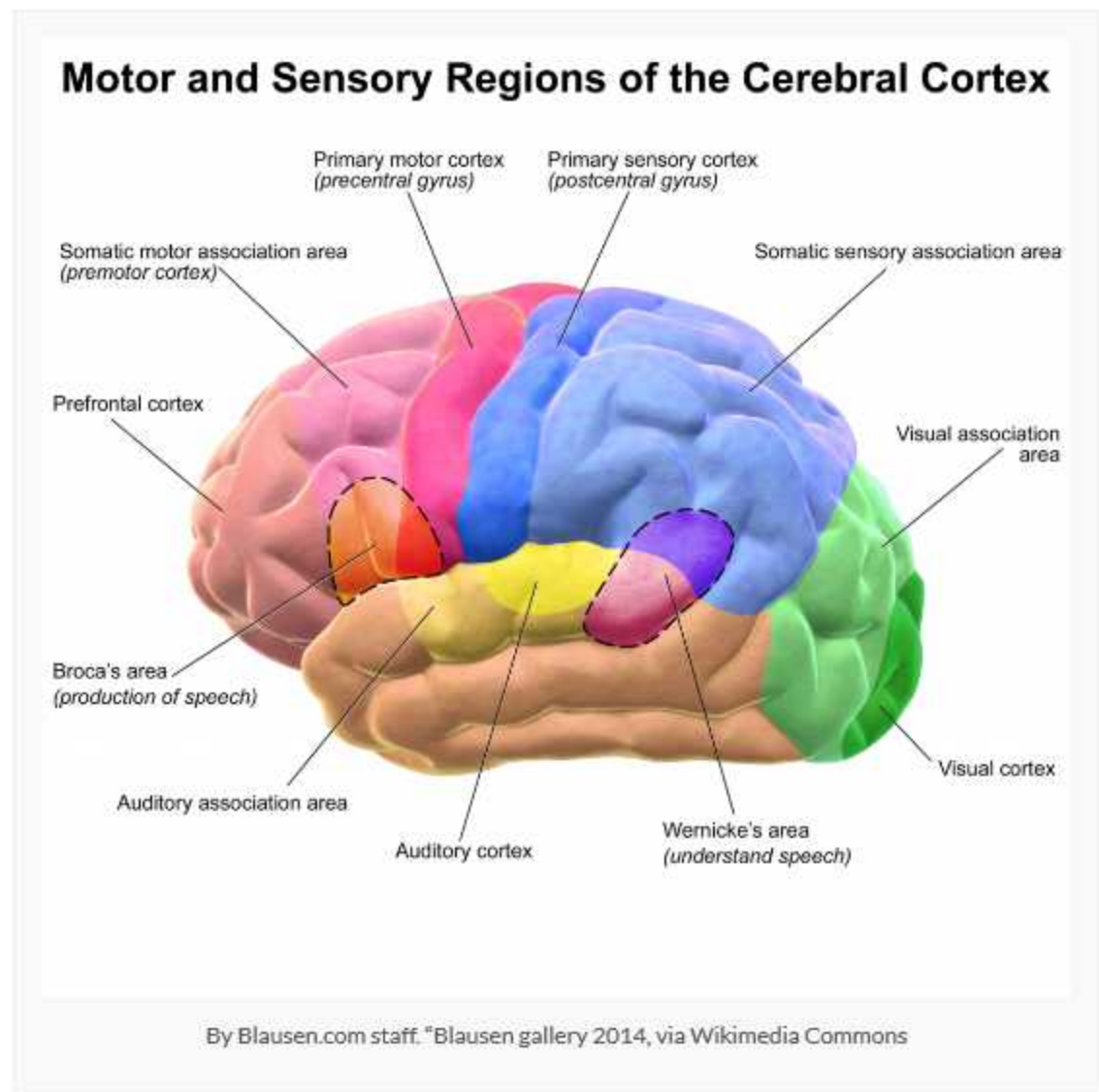
Areas of the frontal lobe are responsible for:

- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

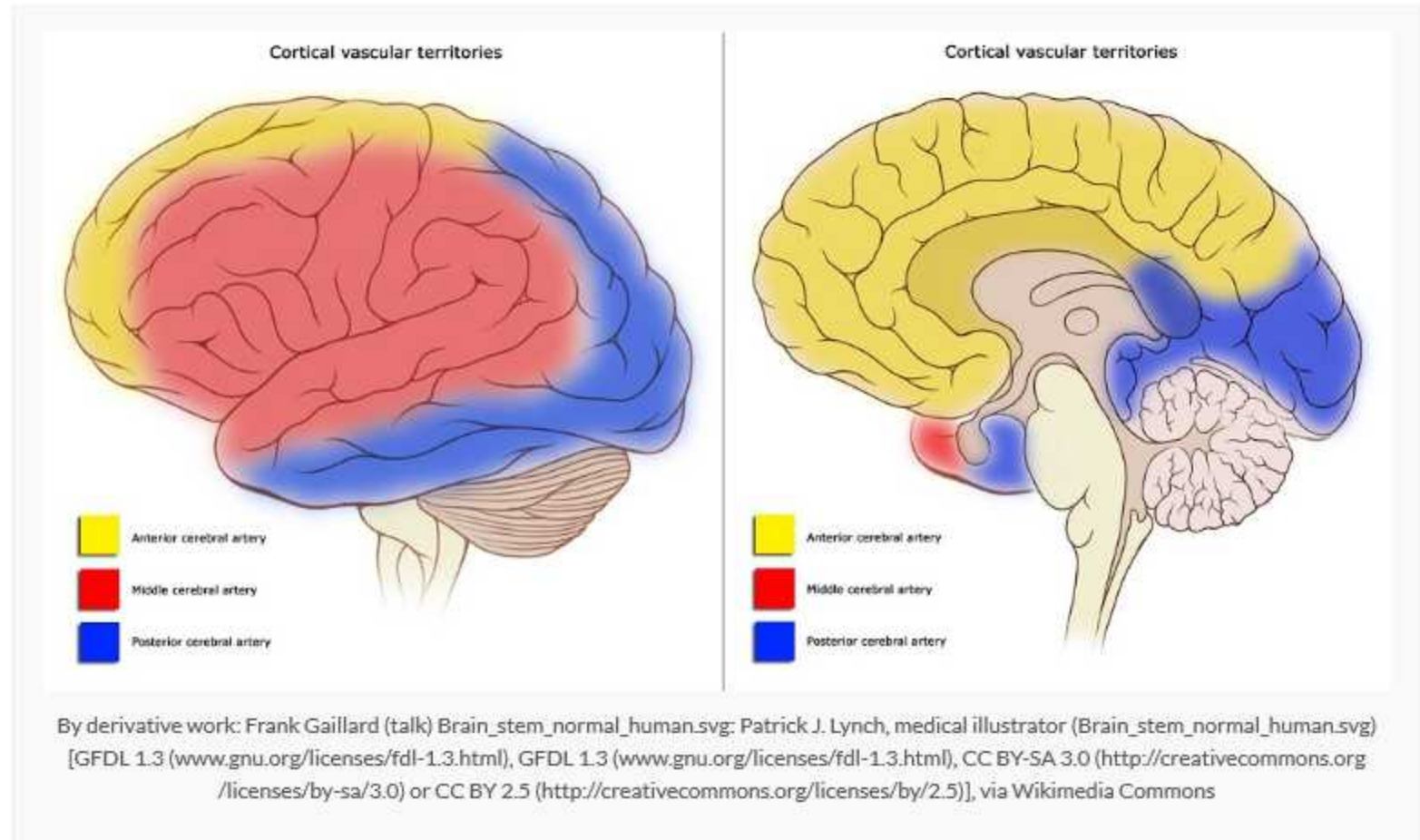
Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.



Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

< Previous

Next >

Something wrong?

Question Navigator

131	Answered
132	Answered
133	Answered
134	Current Question
135	...
136	...
137	...
138	...
139	...
140	...
141	...
142	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 135 of 142



Which of the following vessels does not contribute to the circle of Willis:

- ☐ a Anterior cerebral artery
- ☐ b Middle cerebral artery
- ☐ c Posterior cerebral artery
- ☐ d Anterior communicating artery
- ☐ e Posterior communicating artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Current Question

136 ...

137 ...

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 135 of 142



Which of the following vessels does not contribute to the circle of Willis:

- a) Anterior cerebral artery
- b) Middle cerebral artery
- c) Posterior cerebral artery
- d) Anterior communicating artery
- e) Posterior communicating artery

Answer

The arterial circle of Willis receives its blood supply from the internal carotid and vertebral arteries. The middle cerebral artery is the lateral continuation of the internal carotid artery and does not form part of the circle.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

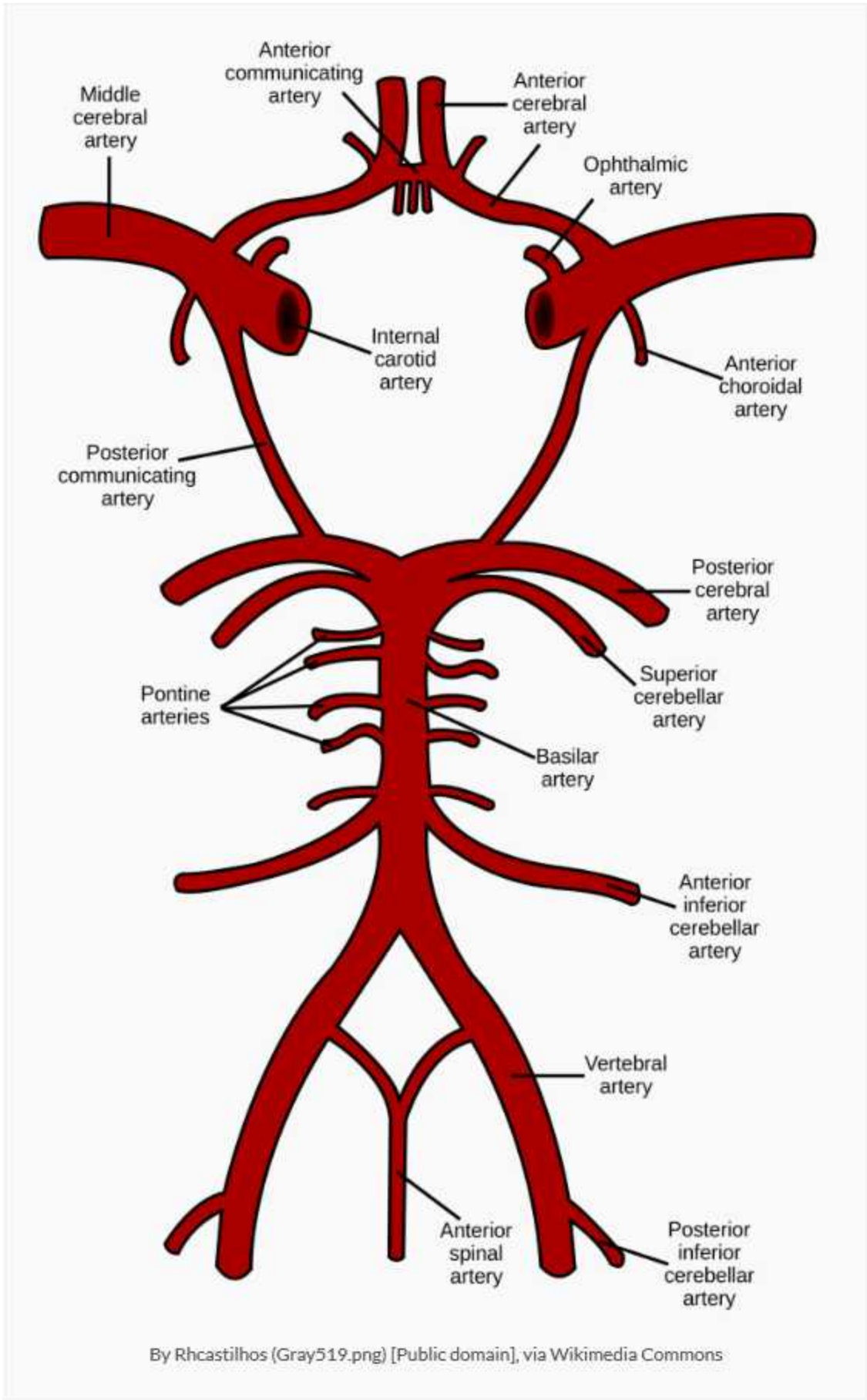
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebellar artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

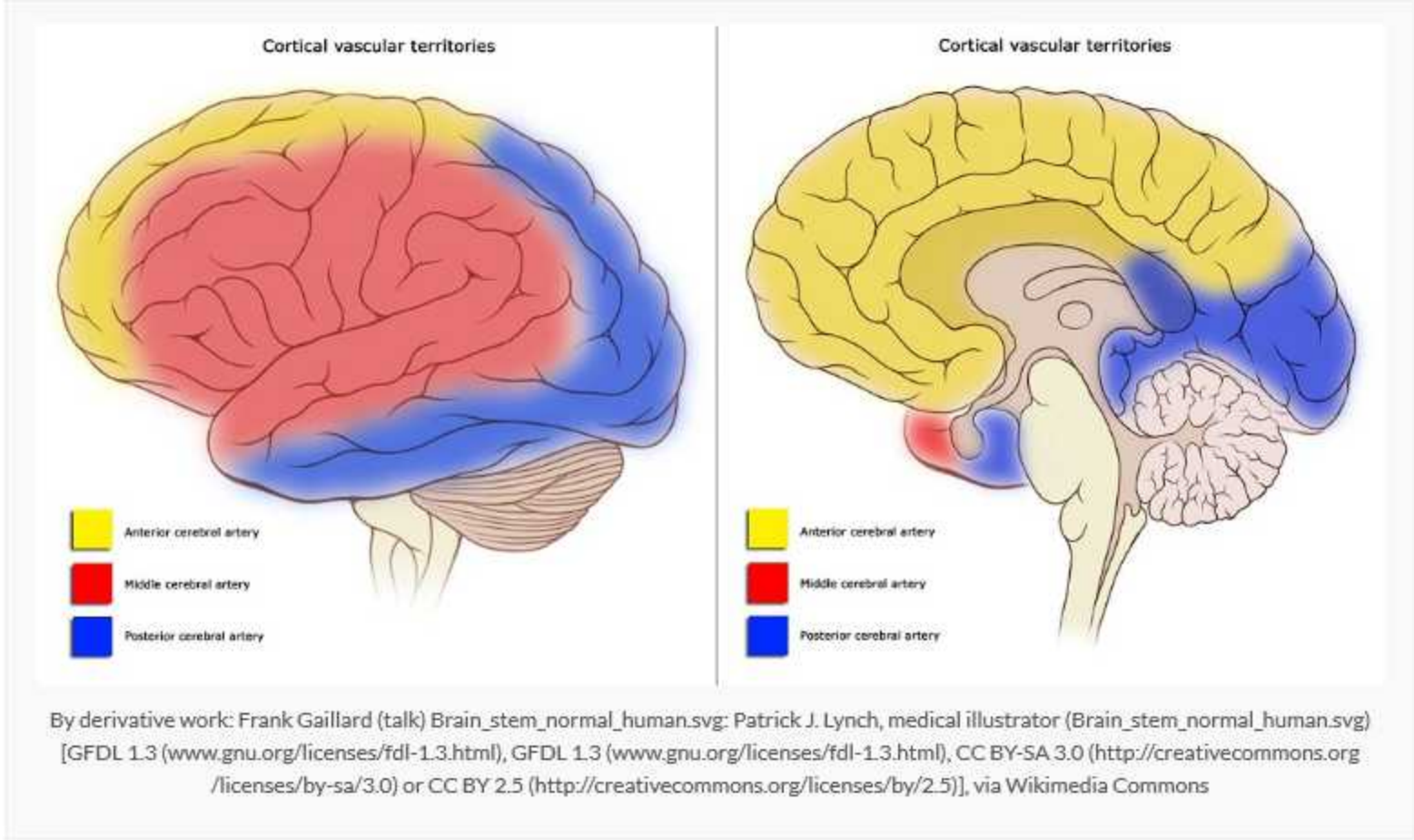
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change• PARIETAL LOBE: contralateral somatosensory loss in the lower limb• CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none">• FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood• TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia• PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia• N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none">• OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral)• TEMPORAL LOBE: confusion, memory deficit• OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



Question Navigator

131	Answered
132	Answered
133	Answered
134	Answered
135	Current Question
136	...
137	...
138	...
139	...
140	...
141	...
142	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia
- Advanced Life Support Group
- Emergency Medicine Journal
- Lifethefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 136 of 142



Damage to Broca's area will most likely result in which of the following clinical features:

- ☐ a Nystagmus
- ☐ b Dysarthria
- ☐ c Visual disturbance
- ☐ d Expressive dysphasia
- ☐ e Receptive dysphasia

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Answered

136 Current Question

137 ...

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

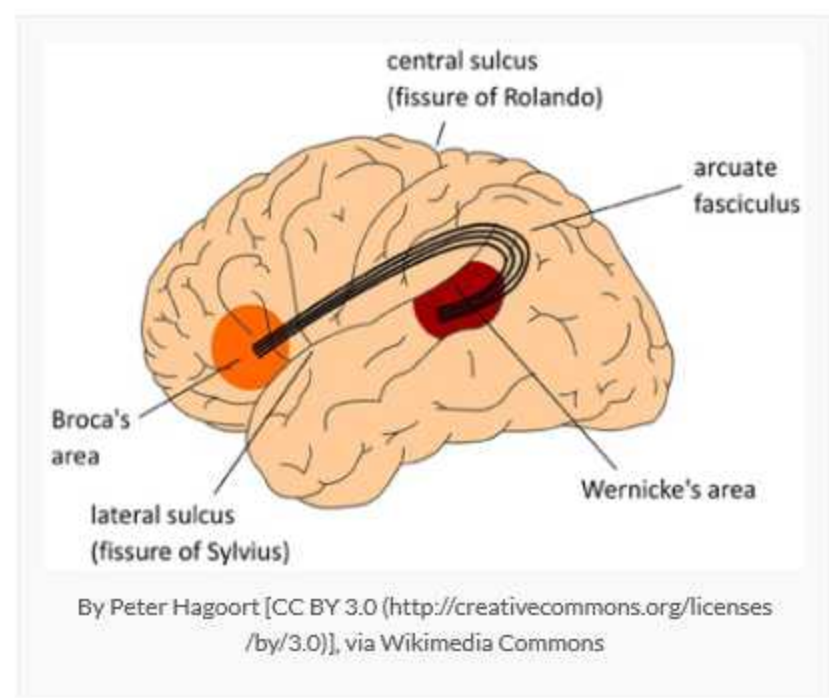
Question 136 of 142

Damage to Broca's area will most likely result in which of the following clinical features:

- a) Nystagmus
- b) Dysarthria
- c) Visual disturbance
- d) Expressive dysphasia
- e) Receptive dysphasia

Answer

The Broca speech area, in the frontal lobe of the dominant hemisphere, is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus. Damage to this area will result in an expressive dysphasia.



Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

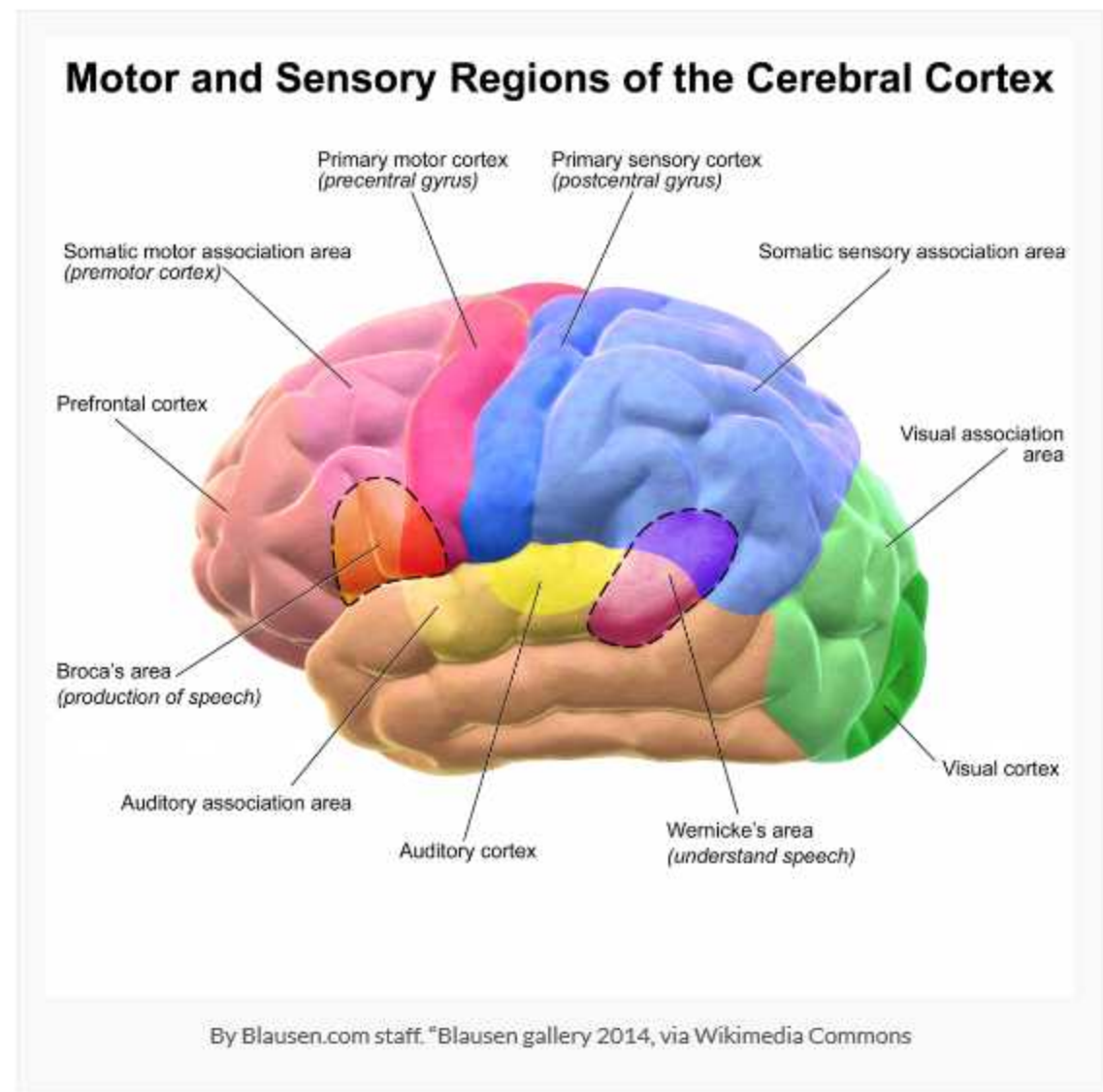
Areas of the frontal lobe are responsible for:

- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

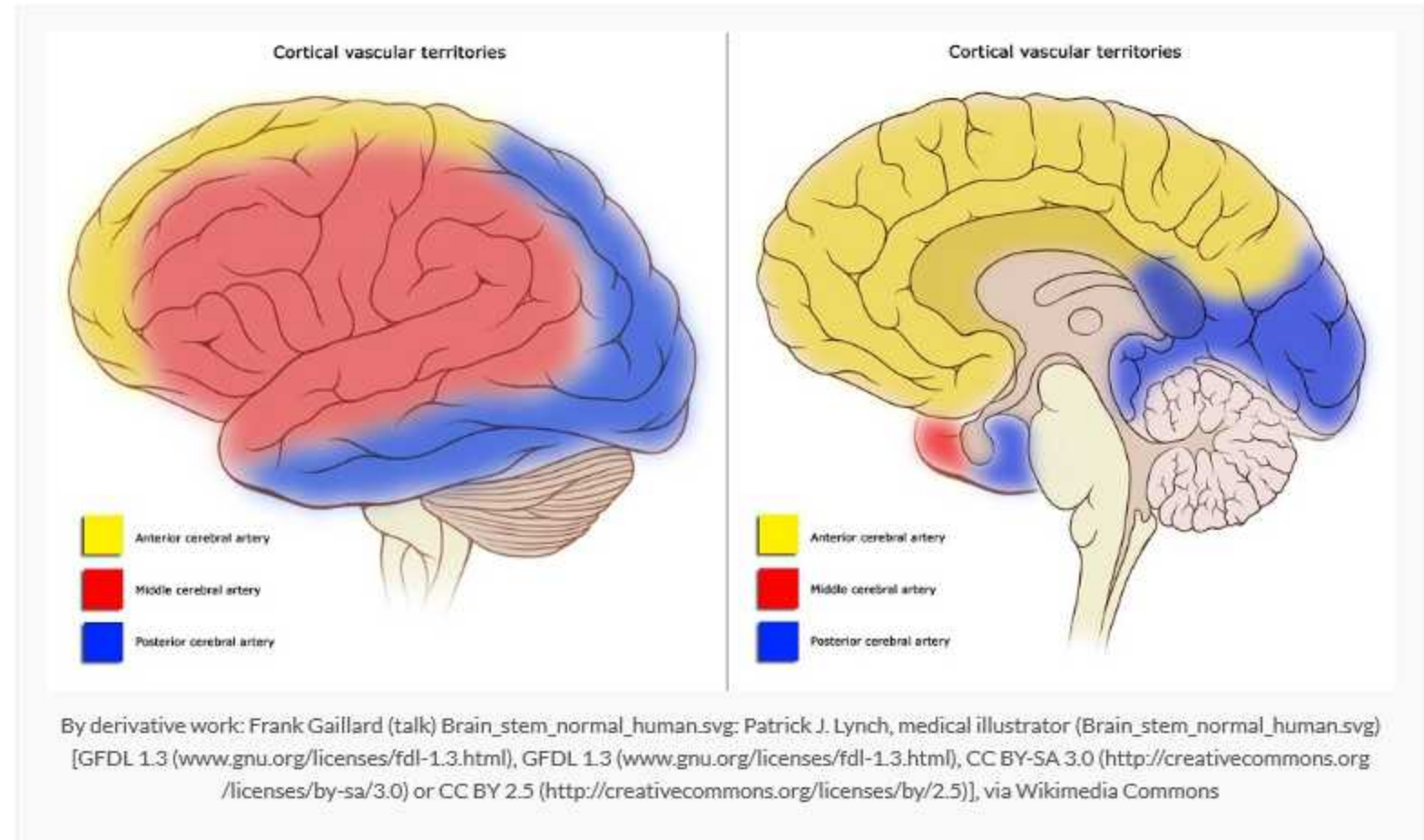
Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.



Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).



Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

< Previous

Next >

Something wrong?

Question Navigator

131	Answered
132	Answered
133	Answered
134	Answered
135	Answered
136	Current Question
137	...
138	...
139	...
140	...
141	...
142	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk

[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 137 of 142



A 68 year old woman, with a known brain tumour, presents to ED. Her left eye is directed outwards and downwards, she is unable to open her eye and her pupil is fixed and dilated. Which of the following structures is most likely being compressed by the tumour:

- ☐ a Optic nerve
- ☐ b Oculomotor nerve
- ☐ c Trochlear nerve
- ☐ d Superior cervical ganglion
- ☐ e Trigeminal ganglion

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Answered

136 Answered

137 Current Question

138 ...

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 137 of 142



A 68 year old woman, with a known brain tumour, presents to ED. Her left eye is directed outwards and downwards, she is unable to open her eye and her pupil is fixed and dilated. Which of the following structures is most likely being compressed by the tumour:

- Optic nerve
- Oculomotor nerve** ✓
- Trochlear nerve
- Superior cervical ganglion
- Trigeminal ganglion

Answer

Injury to the oculomotor nerve results in the eyeball being directed laterally and downwards, complete ptosis and a fixed and dilated pupil.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

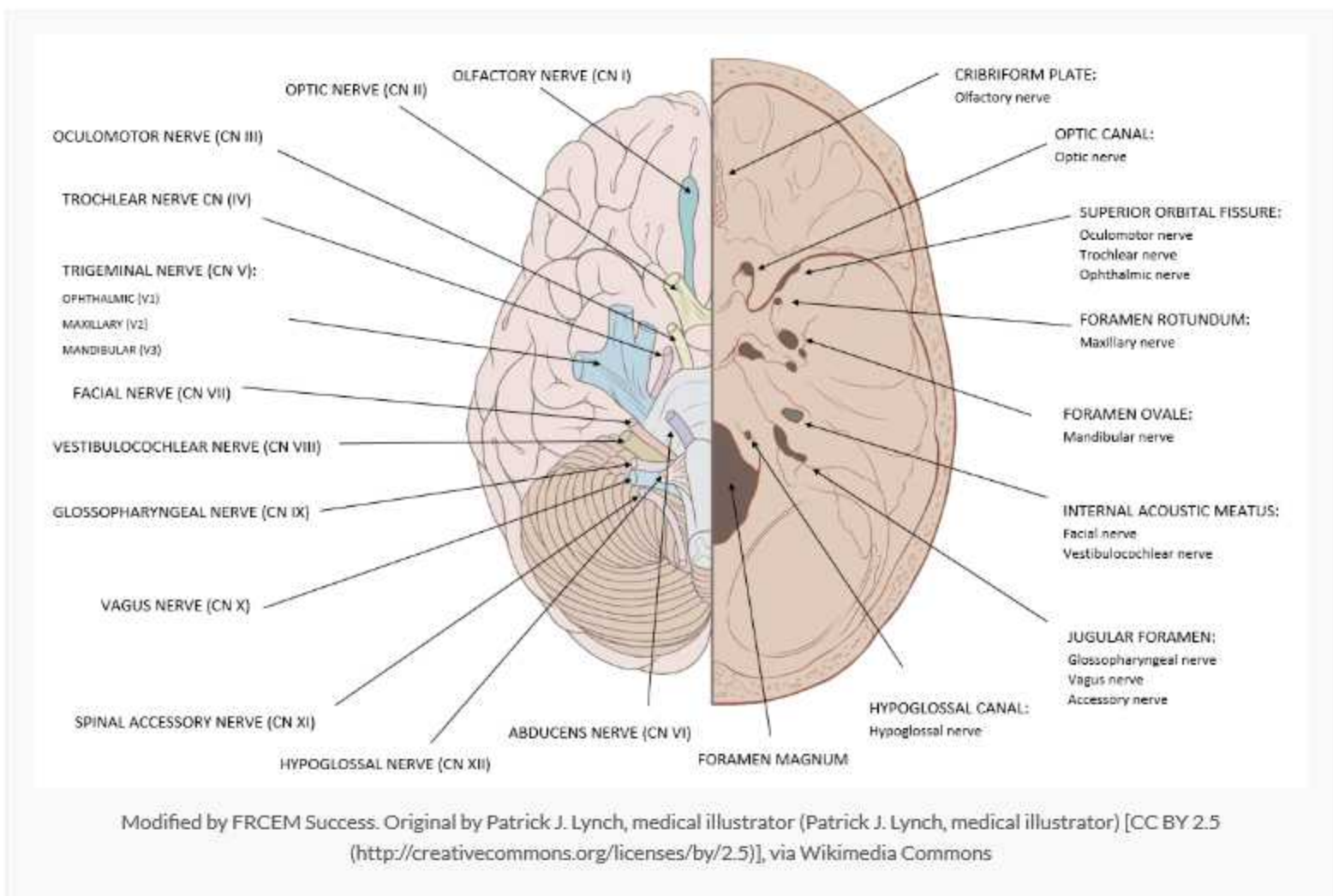
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

131	Answered
132	Answered
133	Answered
134	Answered
135	Answered
136	Answered
137	Current Question
138	...
139	...
140	...
141	...
142	...

[< Previous](#)
[Next >](#)
[Something wrong?](#)

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 138 of 142



Which of the following arteries is the terminal branch of the basilar artery:

- ☐ a Anterior inferior cerebellar artery
- ☐ b Superior cerebellar artery
- ☐ c Posterior inferior cerebellar artery
- ☐ d Posterior cerebral artery
- ☐ e Posterior spinal artery

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Answered

136 Answered

137 Answered

138 Current Question

139 ...

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 138 of 142



Which of the following arteries is the terminal branch of the basilar artery:

- a) Anterior inferior cerebellar artery
- b) Superior cerebellar artery
- c) Posterior inferior cerebellar artery ✗
- d) Posterior cerebral artery ✓
- e) Posterior spinal artery

Answer

The posterior cerebral artery is the terminal branch of the basilar artery.

Notes

The brain receives its arterial supply from two pairs of vessels, the vertebral arteries and the internal carotid arteries.

Internal carotid arteries

The two internal carotid arteries arise from the common carotid arteries at the level of vertebra C4 and enter the cranial cavity through the carotid canal in the temporal bone. Entering the cranial cavity, each internal carotid artery gives off the following paired branches:

- The ophthalmic artery (supplying structures in the orbit and giving rise to the central retinal artery supplying the retina)
- The posterior communicating artery (joining the posterior and middle cerebral arteries)
- The anterior choroidal artery (supplying parts of the optic pathway, the internal capsule, the midbrain and the choroid plexus)
- The anterior cerebral artery (supplying the medial cerebral hemisphere)
- The anterior communicating artery (joining the two anterior cerebral arteries)
- The middle cerebral artery (supplying the lateral cerebral hemispheres)

Vertebral arteries

The two vertebral arteries, branches of the subclavian arteries, ascend through the transverse foramina of the upper six cervical vertebrae before entering the cranial cavity through the foramen magnum. The vertebral arteries give rise to the following branches:

- The single anterior spinal artery (supplying the anterior portion of the spinal cord)
- The posterior inferior cerebellar arteries (supplying the cerebellum)
- The posterior spinal arteries (supplying the posterior portion of the spinal cord) – either a direct branch of the vertebral artery or of the posterior inferior cerebellar artery

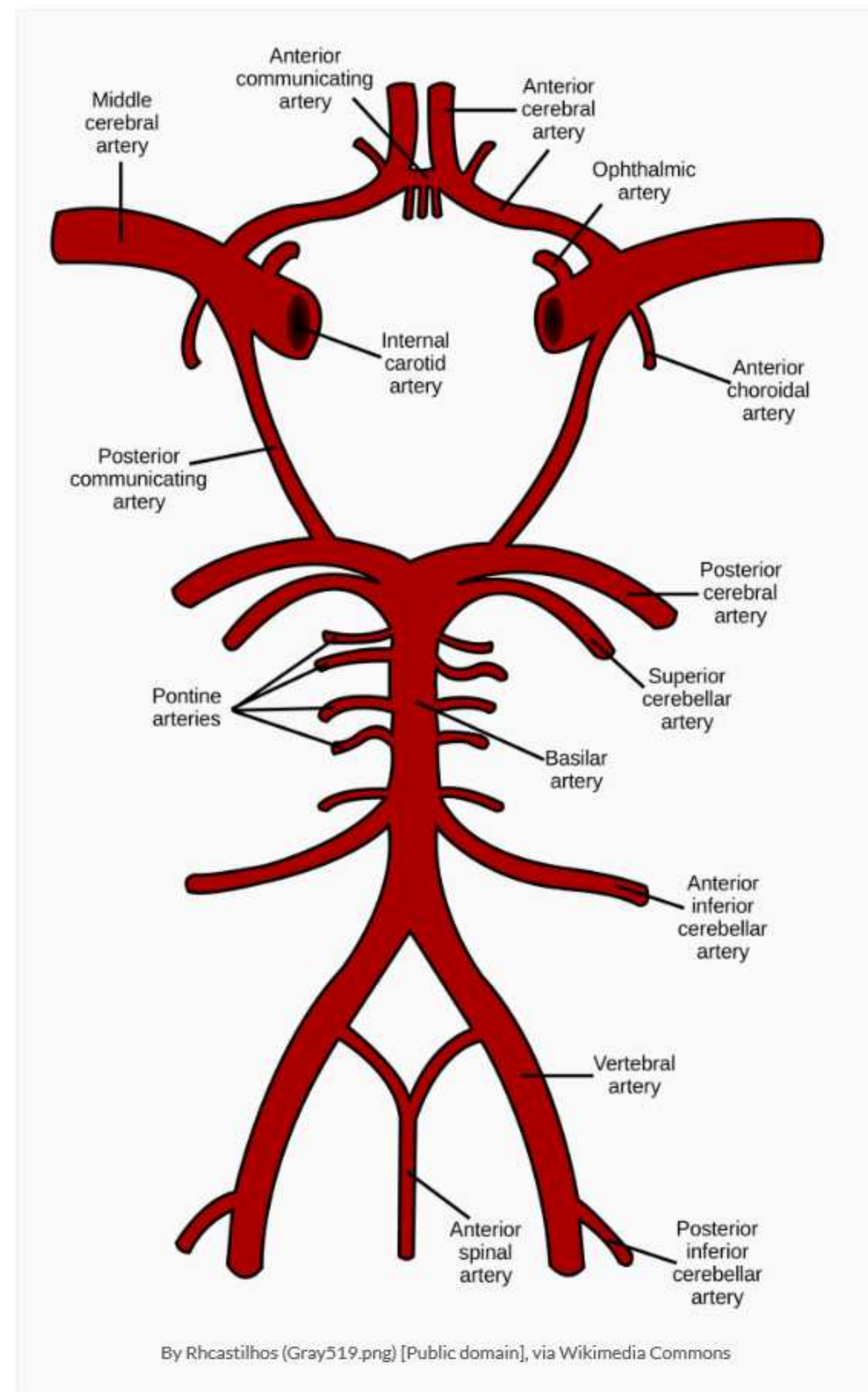
The basilar artery is formed by the joining of the two terminal vertebral arteries inferior to the pons. The basilar artery gives rise to the following paired branches:

- Pontine arteries (supplying the pons and adjacent structures)
- Labyrinthine artery (supplying the vestibular apparatus and cochlea)
- Anterior inferior cerebellar artery (supplying the cerebellum)
- Superior cerebellar artery (supplying the cerebellum)
- Posterior cerebral artery (supplying the occipital lobe and the inferior temporal lobe)

Cerebral arterial circle (of Willis)

The cerebral arterial circle of Willis is positioned around the optic chiasm and formed by the anterior communicating, anterior cerebral, internal carotid, posterior communicating and posterior cerebral arteries.

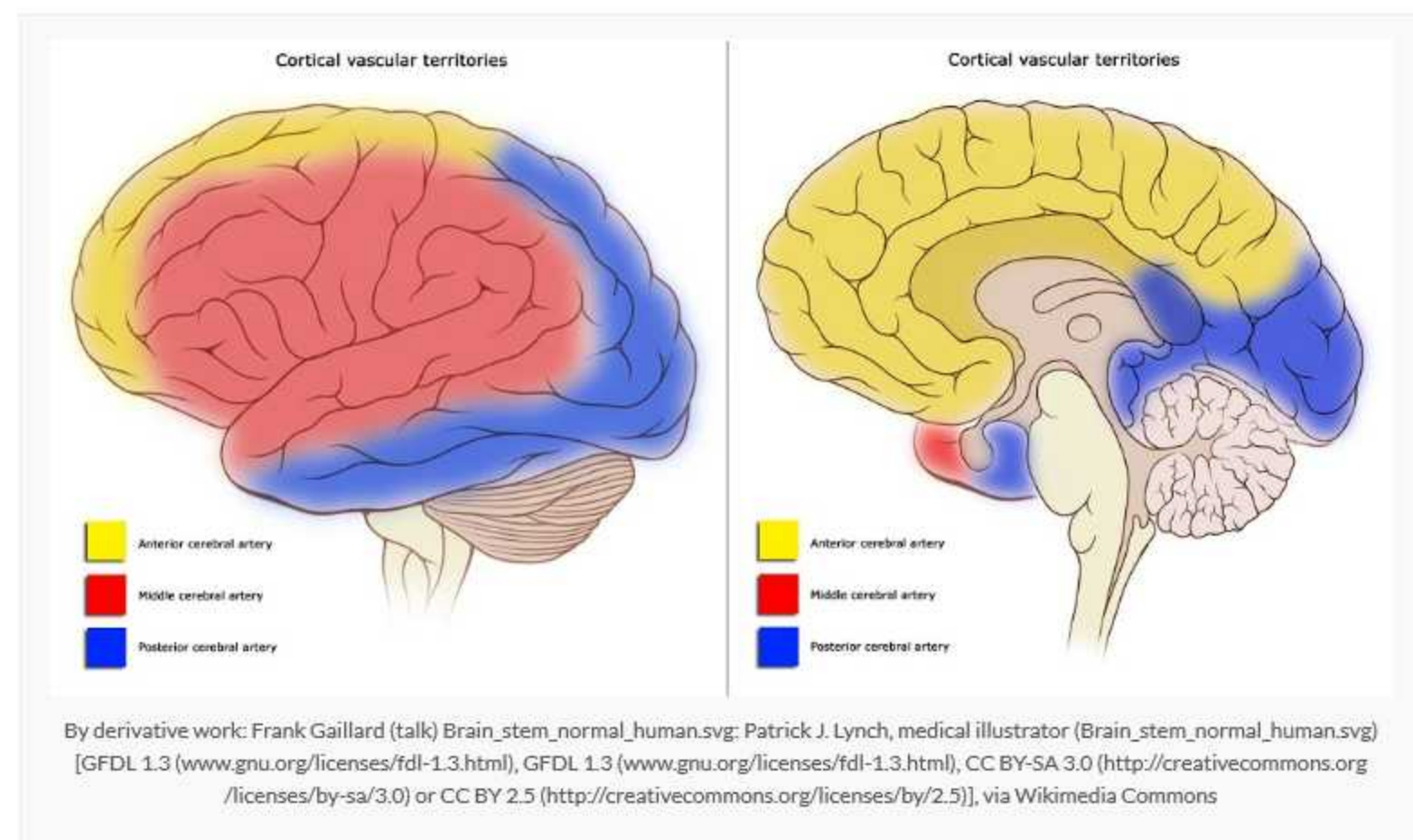
Cerebral aneurysms tend to arise from the vessels in and around the circle of Willis; the cerebral arterial circle contains about 60% of berry aneurysms (a further 30% arise from the middle cerebral artery and the remaining 10% are found in the vertebrobasilar system). Aneurysm of the anterior communicating artery may compress the optic chiasm and cause a bitemporal hemianopia. Aneurysm of the posterior communicating artery may cause an oculomotor nerve palsy. Rupture of berry aneurysm is a common cause of spontaneous subarachnoid haemorrhage.



Clinical implications

The middle cerebral artery is the largest branch of the internal carotid artery and supplies the largest area of the cerebral cortex. It is the most commonly involved artery in stroke. Pure anterior cerebral artery infarcts are rare because of the collateral circulation provided by the anterior communicating artery.

Blood vessel	Territory of supply	Occlusion
Anterior cerebral artery	Medial cerebral hemisphere including the frontal lobe, superior parietal lobe and the anterior corpus callosum	<ul style="list-style-type: none"> • FRONTAL LOBE: contralateral weakness in lower limb, dysarthria/dysphasia, apraxia, urinary incontinence, personality change • PARIETAL LOBE: contralateral somatosensory loss in the lower limb • CORPUS CALLOSUM: dyspraxia and tactile agnosia
Middle cerebral artery	Lateral convexity of cerebral hemisphere including the frontal lobe, superior temporal lobe, inferior parietal lobe and the basal ganglia and internal capsule	<ul style="list-style-type: none"> • FRONTAL LOBE: contralateral weakness (face/arm > leg), contralateral somatosensory loss (face/arm > leg), conjugate deviation of the eyes to affected side, expressive dysphasia, change in judgement, insight and mood • TEMPORAL LOBE: deafness (if bilateral), receptive dysphasia, auditory illusions and hallucinations, contralateral superior quadrantanopia • PARIETAL LOBE: loss of sensory discrimination, hemineglect, apraxia, contralateral inferior quadrantanopia • N.B. contralateral homonymous hemianopia will occur if the entire optic radiation is affected, and global dysphasia will occur if both the Broca and Wernicke speech areas are affected
Posterior cerebral artery	Occipital lobe, inferior temporal lobe (including hippocampal formation), thalamus and the posterior aspect of the corpus callosum and internal capsule	<ul style="list-style-type: none"> • OCCIPITAL LOBE: contralateral homonymous hemianopia with macular sparing (the macular area is additionally supplied by the middle cerebral artery), cortical blindness (if bilateral) • TEMPORAL LOBE: confusion, memory deficit • OCCIPITOTEMPORAL REGION: prosopagnosia, colour blindness



FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 139 of 142



A patient complains of diplopia and on examination is found to have a depressed and abducted eye with ptosis. Which of the following nerves is most likely to be affected:

- ☐ a Trochlear nerve
- ☐ b Abducens nerve
- ☐ c Oculomotor nerve
- ☒ d Optic nerve
- ☐ e Ophthalmic division of the trigeminal nerve

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Answered

136 Answered

137 Answered

138 Answered

139 Current Question

140 ...

141 ...

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 139 of 142



A patient complains of diplopia and on examination is found to have a depressed and abducted eye with ptosis. Which of the following nerves is most likely to be affected:

- a) Trochlear nerve
- b) Abducens nerve
- c) Oculomotor nerve
- d) Optic nerve
- e) Ophthalmic division of the trigeminal nerve

Answer

Oculomotor (CN III) nerve palsy results in a depressed and abducted (down and out) eye, diplopia, ptosis and a fixed and dilated pupil.

Notes

Cranial nerve	Oculomotor nerve (CN III)
Key anatomy	Arises from midbrain, passes through lateral aspect of cavernous sinus, exits skull through superior orbital fissure
Function	Motor: innervates four extraocular muscles (inferior oblique, superior, inferior and medial rectus muscles), levator palpebrae superioris muscle (elevation of upper eyelid), sphincter pupillae muscle (pupillary constriction), ciliary muscle (accommodation), efferent pathway of pupillary light reflex
Assessment	Eye movements, accommodation, pupillary light reflex
Clinical effects of injury	Depressed and abducted (down and out) eye, diplopia, ptosis, fixed and dilated pupil with loss of accommodation and abnormal pupillary light reflex
Causes of injury	Tumours, aneurysms (posterior communicating), subdural or epidural haematoma, diabetes mellitus

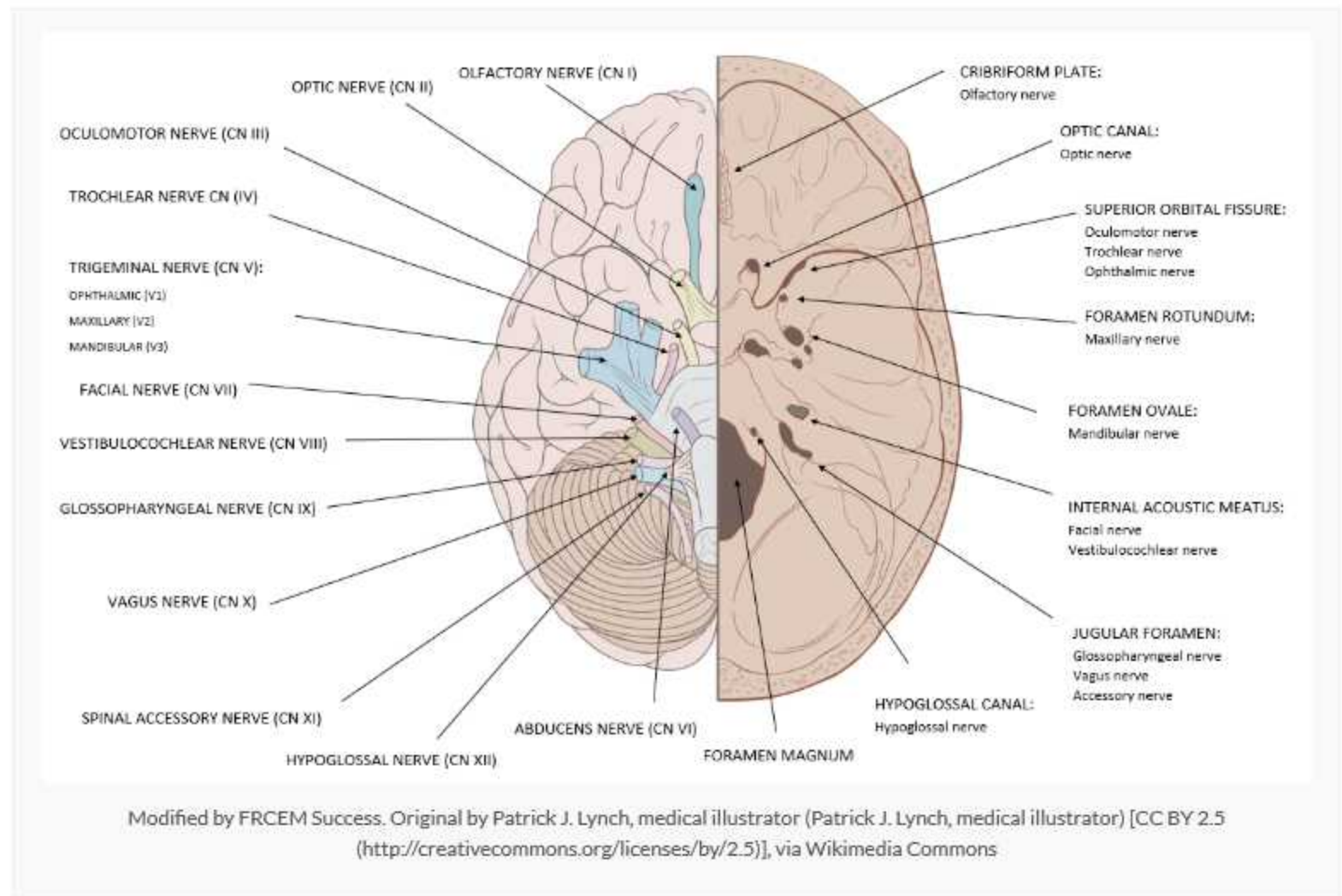
Function

The oculomotor nerve (CN III) is a motor nerve innervating all of the extraocular muscles responsible for eyeball movements (except for the superior oblique and lateral rectus muscles) and the levator palpebrae superioris muscle responsible for elevation of the upper eyelid. It also provides the parasympathetic supply to the sphincter pupillae (pupillary constriction) and ciliary muscle (accommodation).

Key anatomy

The oculomotor nerve arises from the anterior aspect of the midbrain and then passes forwards between the posterior cerebral and superior cerebellar arteries, very close to the posterior communicating artery. It pierces the dura near the edge of the tentorium cerebelli, and passes through the lateral part of the cavernous sinus (together with CN IV and VI nerves and the ophthalmic division of CN V) to enter the orbit through the superior orbital fissure.

At this point it divides into a superior branch innervating the superior rectus and levator palpebrae superioris muscles and an inferior branch innervating the inferior rectus, medial rectus and inferior oblique muscles and supplying parasympathetic innervation to the sphincter pupillae and ciliary muscles. The parasympathetic fibres pass on the periphery of the oculomotor nerve.



Assessment

The oculomotor nerve should be assessed by testing eye movements (which also tests CN IV and VI), accommodation and the pupillary light reflex (which also tests CN II).

Clinical implications

CN III palsy results in:

- A depressed and abducted eye (down and out pupil) due to unopposed action of the lateral rectus and superior oblique muscles
- Diplopia on looking up and in
- Ptosis
- Fixed pupillary dilatation
- Loss of accommodation (cycloplegia)
- Abnormal pupillary light reflex
 - Ipsilateral direct reflex lost
 - Contralateral consensual reflex intact
 - Contralateral direct reflex intact
 - Ipsilateral consensual reflex lost

Causes of CN III palsy:

- Compressive aetiology
 - Tumours (commonly by compression against the fixed edge of the tentorium as the medial part of the temporal lobe herniates down)
 - Aneurysms (carotid or posterior communicating artery)
 - Subdural or epidural haematoma
 - Trauma
 - Cavernous sinus disease
- Ischaemic aetiology
 - Diabetes mellitus
 - Hypertension

Compressive causes of CN III palsy cause early pupillary dilatation because the parasympathetic fibres run peripherally in the nerve and are easily compressed. In diabetes mellitus the lesions are ischaemic rather than compressive and therefore typically affect the central fibres resulting in pupillary sparing.

Question Navigator

131	Answered
132	Answered
133	Answered
134	Answered
135	Answered
136	Answered
137	Answered
138	Answered
139	Current Question
140	...
141	...
142	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 140 of 142



A 69 year old patient is brought to ED with acute onset facial weakness on the right side, and difficulty with speech. He is able to respond to questions appropriately by nodding or shaking his head, but his words are jumbled and don't make sense. Which of the following lobes has been affected:

- ☐ a Left parietal lobe
- ☐ b Right parietal lobe
- ☐ c Left temporal lobe
- ☐ d Left frontal lobe
- ☐ e Right frontal lobe

[< Previous](#)
[Next >](#)
[See Answer](#)
[Something wrong?](#)

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Answered

136 Answered

137 Answered

138 Answered

139 Answered

140 Current Question

141 ...

142 ...

FRCEMSuccess

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal



Anatomy: CNS and CN lesions

Question 140 of 142



A 69 year old patient is brought to ED with acute onset facial weakness on the right side, and difficulty with speech. He is able to respond to questions appropriately by nodding or shaking his head, but his words are jumbled and don't make sense. Which of the following lobes has been affected:

a) Left parietal lobe
b) Right parietal lobe
c) Left temporal lobe
d) Left frontal lobe
e) Right frontal lobe

Answer

Right sided facial weakness and expressive dysphasia is most likely caused by a lesion to the left frontal lobe, due to damage to the primary motor cortex and the Broca speech area respectively.

Notes

The frontal lobe extends from the central sulcus to the frontal pole. It is separated from the parietal lobe posteriorly by the central sulcus and from the temporal lobe inferoposteriorly by the lateral sulcus.

Areas of the frontal lobe are responsible for:

- Movement (planning and execution)
- Higher intellect, problem solving and judgement
- Attention and concentration
- Behaviour, personality and mood
- Language production
- Continence

Area	Function	Lesion
Primary motor cortex	Contralateral movement of voluntary muscles	Contralateral UMN weakness/paralysis
Premotor cortex	Role in coordination of complex movements	Apraxia, UMN signs
Supplementary motor cortex	Role in programming complex motor sequences	Inability to plan sequence of complex movements
Frontal eye field	Conjugate deviation of the eyes to the opposite side	Conjugate deviation of the eyes towards the side of the lesion (and away from the side of weakness)
Broca speech area (dominant hemisphere)	Speech production	Expressive dysphasia
Prefrontal cortex	Higher intellect, problem-solving, judgement, personality, emotion and mood, central control of micturition	Inappropriate social behavior, difficulty in adaptation and loss of initiative, primitive reflexes, inability to concentrate, incontinence

Areas of the frontal lobe

- The primary motor cortex is located in the precentral gyrus and is responsible for voluntary movements of muscles of the opposite side of the body.
- The premotor cortex plays a role in the control and coordination of proximal and axial muscles, it prepares the motor cortex for specific movements in advance of their execution.
- The supplementary motor cortex is concerned with programming of complex movements and regulates somatosensory input into the motor cortex.
- The Broca speech area (in the dominant hemisphere only) is the 'expressive' centre for the production of speech. It is connected to the Wernicke speech area by the arcuate fasciculus.
- The frontal eye field is involved in making eye movements to the contralateral side.
- The prefrontal cortex governs personality, emotional expression, initiative and the ability to plan.
- The cortical micturition centre, within the prefrontal cortex, is involved in the cortical inhibition of the voiding of the bladder.

Motor and Sensory Regions of the Cerebral Cortex

Primary motor cortex (precentral gyrus)
Primary sensory cortex (postcentral gyrus)
Somatic motor association area (premotor cortex)
Somatic sensory association area
Prefrontal cortex
Visual association area
Broca's area (production of speech)
Auditory association area
Auditory cortex
Wernicke's area (understand speech)
Visual cortex

By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the frontal lobe is from the anterior cerebral artery (supplying the medial surface of the primary motor cortex which controls the lower limb) and the middle cerebral artery (supplying the lateral surface of the primary motor cortex which controls the face and upper limb).

Cortical vascular territories

Anterior cerebral artery
Middle cerebral artery
Posterior cerebral artery

By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the frontal lobe may cause a diverse range of presentations including:

- contralateral weakness/paralysis in an UMN pattern (damage to the primary motor cortex)
- inability to plan sequence of complex movements (damage to the premotor cortex and supplementary motor cortex)
- conjugate eye deviation where both eyes look towards the side of the lesion and away from the side of weakness (damage to the frontal eye field)
- expressive dysphasia (damage to the Broca speech area)
- personality, mood and behavioural change with loss of initiative and inability to problem solve (damage to the prefrontal cortex)
- primitive reflexes (damage to the prefrontal cortex)
- anosmia (damage to the olfactory tract as a result of close proximity to inferior frontal lobe)
- incontinence (damage to the cortical micturition centre)

Question Navigator

131	Answered
132	Answered
133	Answered
134	Answered
135	Answered
136	Answered
137	Answered
138	Answered
139	Answered
140	Current Question
141	...
142	...

Primary Login

Intermediate Login

USER LOGIN

Anatomy: CNS and CN lesions

Question 141 of 142



Which of the following clinical features is most suggestive of a lesion of the occipital lobe:

- ☐ a Memory impairment
- ☐ b Homonymous hemianopia
- ☐ c Expressive dysphasia
- ☐ d Hemispatial neglect
- ☐ e Conjugate eye deviation

< Previous

Next >

See Answer

Something wrong?

Question Navigator

131 Answered

132 Answered

133 Answered

134 Answered

135 Answered

136 Answered

137 Answered

138 Answered

139 Answered

140 Answered

141 Current Question

142 ...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

PayPal



Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



Anatomy: CNS and CN lesions

Question 141 of 142



Which of the following clinical features is most suggestive of a lesion of the occipital lobe:

- a) Memory impairment
- b) Homonymous hemianopia ✓
- c) Expressive dysphasia
- d) Hemispatial neglect
- e) Conjugate eye deviation

Answer

Homonymous hemianopia is most likely caused by damage to the occipital lobe.

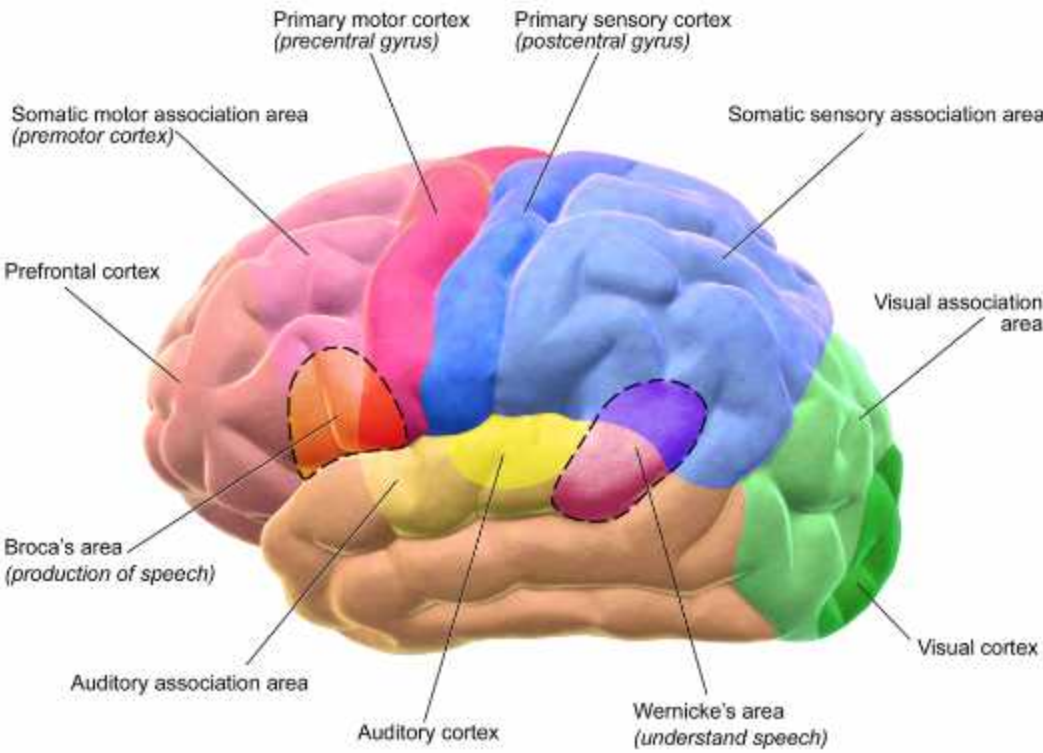
Notes

The occipital lobe rests inferiorly upon the tentorium cerebelli which segregates the cerebrum from the cerebellum. The parieto-occipital sulcus separates the occipital lobe from the parietal and temporal lobes anteriorly.

Areas of the occipital lobe

The primary visual cortex is located within the occipital lobe and together with the visual association cortex is responsible for vision.

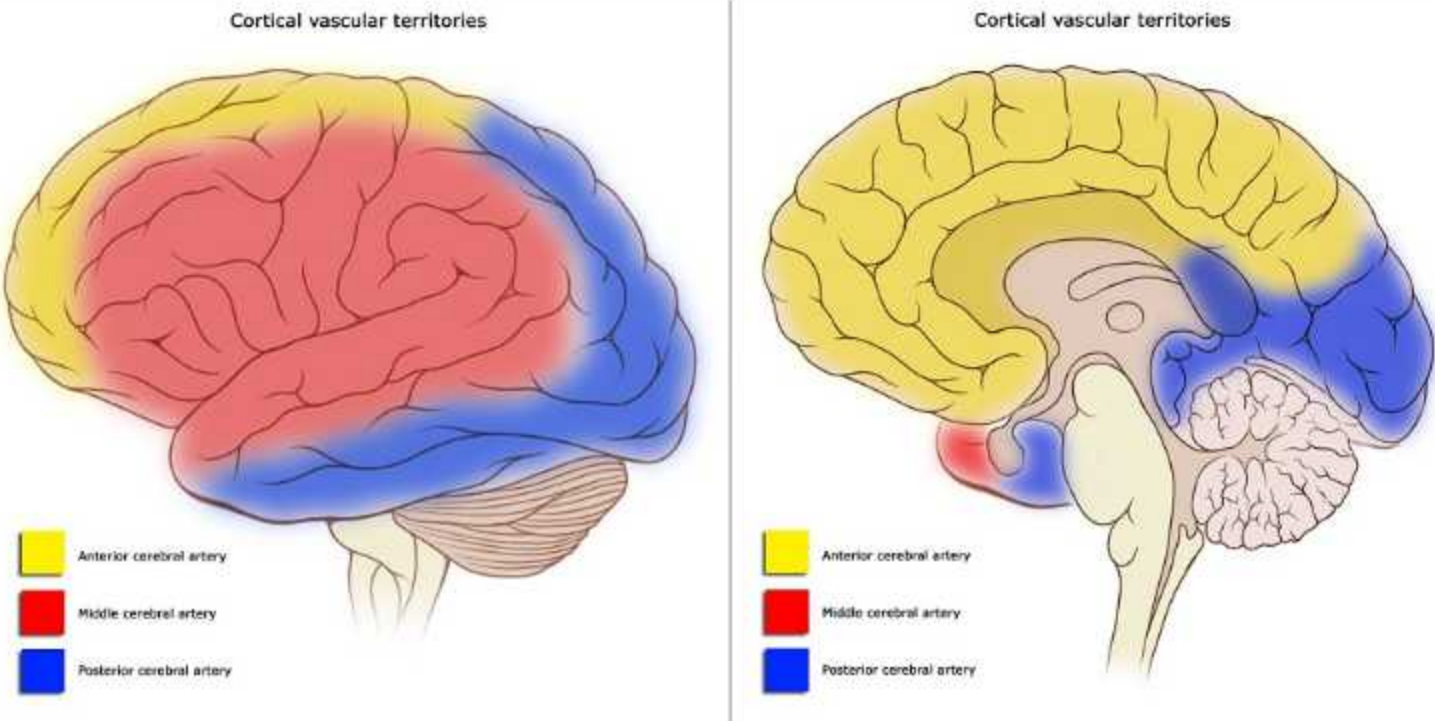
Motor and Sensory Regions of the Cerebral Cortex



By Blausen.com staff. "Blausen gallery 2014, via Wikimedia Commons

Blood supply

The blood supply to the occipital lobe is from the posterior cerebral artery, but the occipital poles, serving macular vision, have additional supply from a branch of the middle cerebral artery.



By derivative work: Frank Gaillard (talk) Brain_stem_normal_human.svg: Patrick J. Lynch, medical illustrator (Brain_stem_normal_human.svg) [GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), GFDL 1.3 (www.gnu.org/licenses/fdl-1.3.html), CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0) or CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Clinical implications

Damage to the occipital lobe can result in:

- Contralateral homonymous hemianopia (with macular sparing)
- Cortical blindness
- Visual agnosia
- Colour blindness
- Visual illusions or hallucinations
- Difficulty reading and writing

Question Navigator

131	Answered
132	Answered
133	Answered
134	Answered
135	Answered
136	Answered
137	Answered
138	Answered
139	Answered
140	Answered
141	Current Question
142	...

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

Terms & Conditions
Get in Touch

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



[Primary Login](#)
[Intermediate Login](#)
[USER LOGIN](#)

Anatomy: CNS and CN lesions

Question 142 of 142



The extracranial portion of the optic nerve is supplied by which of the following blood vessels:

- ☐ a Superficial temporal artery
- ☐ b Facial artery
- ☐ c Ophthalmic artery
- ☐ d Anterior choroidal artery
- ☐ e External carotid artery

[< Previous](#)
[See Answer](#)
[Submit](#)
[Something wrong?](#)

Question Navigator

- 131 Answered
- 132 Answered
- 133 Answered
- 134 Answered
- 135 Answered
- 136 Answered
- 137 Answered
- 138 Answered
- 139 Answered
- 140 Answered
- 141 Answered
- 142 Current Question

FRCEM Success

We are an online revision resource for FRCEM Primary and Intermediate exam preparation.

[Terms & Conditions](#)
[Get in Touch](#)

Resources

- The Royal College of Emergency Medicine
- Irish Association for Emergency Medicine
- Advanced Trauma Life Support
- Resuscitation Council (UK)
- TeachMeAnatomy
- Trauma.org
- Radiopaedia

- Advanced Life Support Group
- Emergency Medicine Journal
- Lifeinthefastlane
- Instant Anatomy
- Patient.co.uk



PayPal

